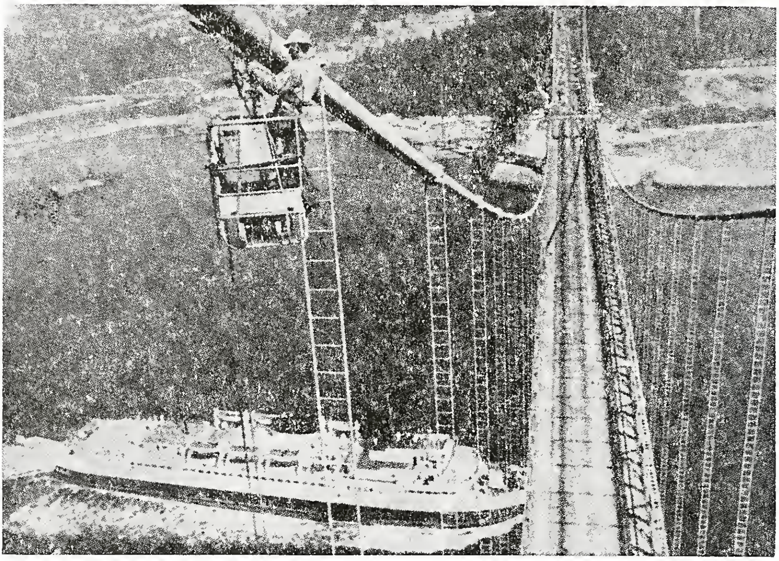
PROCEEDINGS

Seventy-Ninth Annual Convention

OF THE

American Railway
Bridge & Building Association

1974



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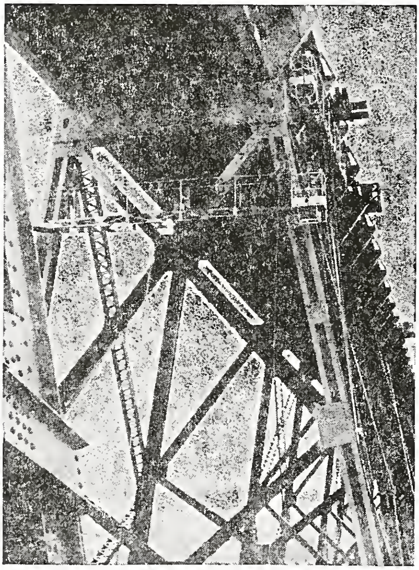

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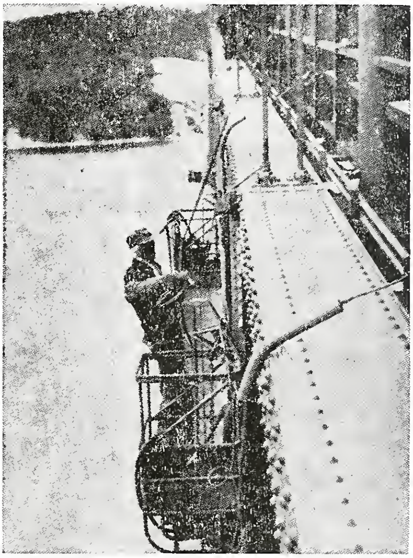

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Proceedings of the

Seventy-Ninth Annual Convention

of the

American Railway
Bridge & Building
Association

Held at

CHICAGO, ILLINOIS

October 1-3, 1974

Published by the Association
18154 Harwood Ave., Homewood, Ill. 60430
R. E. Dove, Editor

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Illinois Central Gulf

Memoir

Thomas Henry Strate

1880-1974

Thomas Henry Strate, retired division engineer for the Chicago, Milwaukee, St. Paul & Pacific Railroad, died July 2, 1974 at a convalescent home in San Ysidro, Calif., at the age of 94. He was buried July 5 at Memorial Park Cemetery in Skokie, Ill. He was survived by two daughters: Mrs. Richard Lutz of Lincolnshire, Ill., and Mrs. C. C. Schramm of Highland Park, Ill.

Mr. Strate was born April 9, 1880 at Moorhead, Minn. He earned his B.S. degree in civil engineering at the University of Minnesota on June 1, 1901. Two days later, he began his railroad career with the Milwaukee Road as a leveler at Minneapolis, Minn. In January 1906, he was promoted to locating and division engineer at Aberdeen, So. Dak. In November 1908, he returned to Minneapolis as an assistant engineer. In May 1910, he was named locating engineer for the Big Black Foot Railway at Bonner, Mont. In November of the same year, he returned to Minneapolis, again as an assistant engineer. In September 1911, he was appointed locating engineer at Aberdeen for the Milwaukee Road's line-extension project to the West Coast. In May 1912, he was named construction engineer for this same project. In May 1915, he was appointed field engineer-evaluation at Minneapolis. In June 1918, he was promoted to valuation engineer at Chicago. In May 1920, he was made engineer of track elevation. In February 1933, he was appointed division engineer for the road's Terminal Division at Chicago, which was the position he held at the time of his retirement November 1, 1947.

Mr. Strate became a member of the ARB&BA in 1918 and a Director in September 1927. He became Fourth Vice President in 1930 and President in September 1935. He was made an Honorary Member in 1950. He was also a member of the American Railway Engineering Association, having joined that group in 1920.

TICKETS for the REMSA show and banquet are here being distributed by C. E. Godfrey and Eilene McGuan, office secretary. Other REMSA officers also served on this committee. A total of 1350 diners enjoyed the food and program.

PROCEEDINGS

October 1-3, 1974

The Joint Meeting of the Roadmasters' and Maintenance of Way Association and the American Railway Bridge & Building Association was called to order at the Palmer House, Chicago, Illinois, Tuesday, October 1, 1974, at 9:30 A.M., E. E. Runde, manager, construction, Illinois Central Gulf, Chicago, President of the Railway Bridge & Building Association, presiding.

President Runde: Will the meeting please come to order.

As a matter of information, I might tell you that as of last evening we had 1232 registrations. There were 808 roadmasters, 265 B. & B. members, and guests, and we have representatives from 12 foreign countries, making a total of 46 representatives from 12 foreign countries who are registered.

As President of the American Railway Bridge & Building Association and on behalf of Bill Autrey, President of the Roadmasters and Maintenance of Way Association, I declare this, the 86th Annual Convention of the Roadmasters and Maintenance of Way Association, and the 79th Annual Convention of the American Railway Bridge & Building Association to be opened in Joint Session.

Before continuing with these proceedings, it is proper that we pause and ask for devine guidance that our deliberations will be successful. For this purpose we would like to call upon the Reverend Dr. Kenneth Hildebrand, retired Pastor of the Central Church of Chicago. Please rise and remain standing during the invocation. Dr. Hildebrand.

(Dr. Kenneth Hildebrand gave the invocation)

President Runde: Thank you, Dr. Hildebrand. We know that you have a busy schedule so please feel free to leave whenever you wish. Of course, should you care to remain for all or any part of our program, you are certainly welcome to do so.

Fellow members of the B. & B. Association and the Roadmasters' Association, distinguished visitors and guests, ladies and gentlemen, we welcome each of you to this, our 29th consecutive annual meeting of our two Associations. We believe we have prepared a most interesting and informative program and we feel sure you will benefit from it. The program is the result of considerable effort on the part of your fellow members of both Associations.

Our friends from REMSA are an important part of this Association and this year they are displaying their wares at the International Amphitheatre. We want all of you to get the most from our Convention and from the REMSA exhibit. With this thought in mind, we have scheduled all our meetings here at the Palmer House in the morning only, leaving you free to attend the REMSA exhibits in the afternoon.

Those of you who are visitors to our convention are cordially welcome and if you meet the requirements for membership you are invited to join either one or both of our Associations. Application blanks are available in the registration room.

It is our understanding that the Railroad Systems & Management Association is meeting here at the Palmer House at this time and that this group includes members from several European countries. We wish to welcome this group and invite them to attend our meetings. If any are present in the audience this morning, please stand and be recognized. Thank you, gentlemen.

We have a very interesting program set up for the ladies. Registration today is in Parlor "H" on the sixth floor, and tomorrow in Private Dining Room 18 on the Club Floor, where they will be served coffee and rolls each morning. A bus tour and luncheon is planned for Wednesday. Make sure your ladies avail themselves to take part in this program.

I will now turn the program over to Mr. Autrey, president of the Roadmasters and Maintenance of Way Association. Mr. Autrey.

President Autrey: Thank you, Mr. Runde.

I join President Runde in welcoming fellow members of both Associations and all our guests to this Joint 1974 Convention. We both hope that all of you will attend the sessions of this Convention. As you know, we have left all afternoons free for you to visit the REMSA exhibits at the Amphitheater, so you should have no trouble in finding time to visit with your friends in the Supply Association and also be able to attend these meetings and hear the reports of the Committees.

I have written to all of your superiors and told them that if they would permit you to attend this convention, that you would learn things from these reports that would enable you to perform your job in a more capable manner when you return to your homes. I know that you will be able to do this from attending these sessions, participating in the floor discussions, asking questions that may occur to you that the Committee member should be able to answer and, also, by visiting with your colleagues from your neighboring railroads.

I might also mention that I have asked a member from each railroad to take the roll of members attending so if you see one of your fellow delegates looking around and checking off a list, what he's doing is checking to see that you are in attendance. So if some of your buddies aren't here, maybe you ought to tell them that somebody is checking the roll and if they don't show up, they might be in trouble. I just thought I would mention it. (Laughter)

Each Association has worked hard in preparing these programs and we hope that they will be of real interest to you and that they will be of real benefit.

We will all meet again here in the morning in joint session and then we will be advised where the separate sessions of the Roadmasters will be and the Bridge & Building.

At this time I would like to introduce those people who are at my left, beginning at my extreme left. As I introduce each person, I would ask that he or she stand and remain standing until all have been introduced. I will also ask that you withhold your applause until all have been introduced.

First, I will introduce the officers and members of the Roadmasters' Association.

First, Mrs. Ann Wilson, Secretary of the Roadmasters and B & B.

Next, Mr. Bill Cruse, assistant chief engineer of staff, Rock Island, and Treasurer of the Roadmasters' Association.

Next, Mr. H. D. Hahn, director of public works, engineering, Chicago & North Western, and a Director.

Mr. R. K. Pullem, division engineer, Chessie System, and a Director.

Mr. R. E. Frame, district engineer, Southern Pacific, and a Director.

Mr. R. J. Massey, roadmaster, E. J. & E., and a Director.

Mr. Tom Freeman, track supervisor, Southern, and a Director.

Mr. Al Barr, engineer, maintenance of way, Penn Central, a Director.

Mr. Bill Johnson, 1st Vice President, general roadmaster, SCL.

You may now applaud. (Applause)

Thank you very much.

The next gentleman I would like to introduce is the Executive Director of the AREA, Mr. Earl Hogkins. Earl, will you stand and be recognized. (Applause)

The next place card represents the president of the Illinois Northern Railway and also the operating vice president of the Santa Fe Railway, and my boss. I talked with him about 30 minutes ago and he had every intention of being here, but for some reason, as sometimes happens, I'm afraid he was detained. So I guess we will recognize the empty chair and know that he's out working.

And with that, I'm going to skip over the next two gentlemen, whom you will meet later, and I will turn the rostrum back to Mr. Runde.

President Runde: Thank you, Bill.

At this time, I would like to introduce to you some of the Officers and Directors of the Bridge and Building Association. There are a number of others who could not be present with us today because of their duties in connection with the Convention. You will meet them tomorrow.

As each man is introduced, I ask that he stand and remain standing. Please withhold your applouse until all have been introduced.

At my extreme right, first, Mr. O. C. Denz, supervisor, building maintenance, Milwaukee Road, Director.

Next, Mr. W. S. Stokely, construction engineer, Illinois Central Gulf Railroad, a Director.

Mr. W. H. Huffman, Retired, assistant vice president and chief engineer, Chicago & North Western, who is our Treasurer.

Mr. W. H. Rankin, structural engineer, St. Louis and San Francisco Railway, our 3rd Vice President.

Mr. J. R. Williams. engineer of bridges, Rock Island Lines, 2nd Vice President.

Mr. J. J. Ridgeway, director of engineering services, Bessemer and Lake Erie Railway, who is our 1st Vice President.

You may now applaud. (Applause)

Also, seated at the rostrum is a special guest, Mr. W. L. Smith, president of the Milwaukee Road. Mr. Smith, will you please stand and be recognized. (Applause)

You will meet the other gentlemen seated at the rostrum as the program continues.

Mr. Autrey.

President Autrey: Thank you. We don't get much exercise when we come to these meetings and some of us who are used to it have arranged this so we bounce up and down to get our exercise, if you are wondering why this works this way.

Now, one of the gentlemen I skipped. It is a pleasure to introduce one of our fellow members, who is currently serving as President of another rather outstanding engineering and maintenance association. Mr. Bob Bush, chief engineer, Erie Lackawanna in Cleveland, who will bring greetings from the American Railway Engineering Association. Mr. Bush. (Applause)

Greetings from A.R.E.A.

Mr. Bush: Mr. Autrey, officers and members of the Roadmasters and Maintenance of Way Association of America, the American Railway Bridge & Building Association, and prospective members of both Associations, I bring you greetings and best wishes from all the officers and members of the American Railway Engineering Association.

After a review of the program, I know this will be an interesting and outstanding convention.

The Annual Regional Meeting of the AREA will be held on Wednesday, November 6th, at the Hotel Muehlebach in Kansas City, Missouri. Charlie Weller, a Director of the AREA, and chief engineer of the Rock Island Railroad, is the Chairman of this meeting. He has obtained some very interesting speakers and has set up a very informative program. We invite you all to attend.

I would like to express the appreciation of all those present to Mr. John Rushmer, president, and to the other officers and members of the Railway Engineering and Maintenance Suppliers' Association, for setting up the fine display of equipment and supplies that can help each of us to better maintain our railroad.

You have a full schedule, Mr. Autrey, and I will not take any more time, but just say thank you. (Applause)

President Autrey: Thank you, Mr. Bush. It is real good to have you with us today and we appreciate you bringing greetings from AREA.

I not only appreciate Mr. Bush bringing us greetings from AREA, but he did me a favor and while I perhaps should not tell the story, I'm going to, anyway.

I had labored for three days on that introduction speech that I just gave introducing Mr. Bush, and you may recall I said "a fellow member of the Association," and then I found that Mr. Bush for some reason had not become a member of our Association and when I wrote to him, I suggested that he join to keep me from having to work another three days on another speech, and he was good enough to do so. So I'm doubly grateful to him for doing that. Thank you.

While I was making that speech, the gentleman whom I mentioned a while ago, Mr. L. Cena, has arrived, president of Illinois Northern Railway and the operating vice president of the

Santa Fe. Mr. Cena, will you stand and be recognized. (Applause)

Now, back to Mr. Runde.

President Runde: As I mentioned earlier this morning, there is another group that works very closely with the Roadmasters and the B & B Association in making this convention a success. This is the Railway Engineering-Maintenance Suppliers' Association, more commonly known to us as REMSA. At this time I would like to introduce to you Mr. J. R. Rushmer, Marketing Manager, Rexnord Machinery Group, President of REMSA. Mr. Rushmer.

Greetings from REMSA

Mr. Rushmer: Mr. President Autrey, President Runde, and guests, ladies and gentlemen:

It is indeed a great pleasure for me to be here as the President of REMSA to take part in welcoming all of you to your convention and to our exhibit.

I know that all the members of REMSA join me in wishing you a very successful and productive meeting and I'm sure REMSA '74 will complement your annual meeting and it will provide an opportunity to you to see the latest tools of your trade.

All the officers and directors of REMSA are at your call. If there is anything we can do to make your stay more enjoyable, please call on us.

I hope you will avail yourselves of the buses at the Monroe Street entrance to and from the Amphitheatre. We know that many of you at least are looking forward to the Annual Banquet tomorrow night and you will hear a little more about that later.

My special honor and privilege is to make two presentations to your people this morning. I didn't take three days, Bill, and I think I should have, to write my speech, but I would like to advise you that it is a tradition of REMSA to recognize your Association Presidents at this time by the presentation of a pin which identifies their office and their years of office. I would like first to ask Bill Autrey to stand. Bill, may I congratulate you on a successful year in office and present you with this pin.

President Autrey: Thank you very much. (Applause)

Mr. Rushmer: Mr. Runde, may I ask that you stand and receive the pin as President of the B & B Association for the years 1973-74. Congratulations on a successful year. (Applause)

President Runde: Thank you, Mr. Rushmer.

Now I would like to introduce Mr. Paul Martin, vice president, Safe-Tran Systems Corporation, and 1st Vice President of REMSA, who has a few words to say to you. Mr. Martin.

Mr. Martin: President Autrey, President Runde, special guests and gentlemen:

This has a little to do with the lighter side of your convention and it is a pleasure to convey this information to you.

Hawaii will be the setting for REMSA's Annual Banquet in the Grand and State Ballrooms here on Wednesday evening. The doors are open at 6:30 P.M. An Hawaiian trio will greet you at the door and this will be followed by a fast-pace program of entertainment following the dinner. We hope this will permit all of you to spend some time Wednesday evening visiting with your friends and suppliers.

Headlining the program is Alan Black, a nationally famous recording artist with Columbia Records.

Nip Nelson, one of the leading impressionists in show business and a performer who has been featured several times in this hotel, in the Empire Room, will hold your attention.

Also on the program is the Ivy Five Ensemble song stylists, who will feature many of the current musical comedy selections.

I am sure you will enjoy the show, especially the music of an old friend of the railroads, Benny Sharp and his orchestra. The Royal Hawaiian Trio will alternate with the orchestra during dinner.

The same ticket arrangement will prevail as has been true through the many years that REMSA has had the privilege of hosting the Joint Roadmasters and Bridge & Building Conventions. REMSA will be honored to host all registered railroad men and their wives. We certainly hope that all of you will be with us for the REMSA Hawaiian Night. May you have an interesting and productive convention. Thank you. (Applause)

President Runde: Thank you, Mr. Martin.

Gentlemen, it is now my pleasure to introduce our next speaker.

He was born in Jacksonville, Florida, and after serving in the Air Force during World War II, he earned a law degree from the University of Virginia in 1948. He saw Korean war duty as a U. S. Air Force Major.

In 1954 he served on a committee for Aviation Development in Florida, and then progressed to membership, and later to the Chairmanship of the Florida Railroad and Public Utilities Commission.

In 1959 he was appointed to the Civil Aeronautics Board and he was named Chairman in 1961. When the Department of Transportation was organized in 1966, he was appointed by the late President Lynden B. Johnson to be its first Secretary.

In 1969, the Illinois Central Railroad was fortunate to obtain his services as president, and in 1972 he was elected president and chief executive officer of the Illinois Central Gulf Railway. Mr. Alan S. Boyd. (Applause)

More Light at the End of the Tunnel

By ALAN S. BOYD

President, Illinois Central Gulf, Chicago

Thank you, Erwin. Good morning, gentlemen.

I could hardly have chosen a better place to be this morning—if I wanted to be with a crowd of people who have perception, good judgement and good taste.

That is what I tell *all* the industry associations fortunate enough to have an Illinois Central Gulf officer as a leader.

Last year, I came before this same joint meeting at the invitation of Roland Peak, who led the Roadmasters. This year I am proud to be back—at the invitation of Erwin Runde, our railroad's contribution to the needs of the American Railway Bridge & Building Association. We are very proud of Erwin, and are pleased that your organization has had the pleasure and the benefit of his leadership this year.

Traditionally, we at Illinois Central Gulf have encouraged our men to participate in the work of the industry's associations. We feel our men are better leaders and better railway officers for such experience. They go back to work at ICG with a broader perspective because of their involvement. This has certainly been true of all the railroad's men who preceded Erwin in leadership posts in your organizations, and we know it will be true for him, too. In the work of organizations, responsibility tends to make big people bigger.

Alan S. Boyd

Last year I came to this group with a deep feeling of optimism. Those of you who were here last year may recall my conviction that the public focus on right-of-way augered well for the upgrading of the nation's track. Those of you who were at the AREA luncheon where I spoke a couple of years ago, may recall I viewed the development of track standards at the Federal Railroad Administration as a hopeful sign for the future roles of all the people in your organizations.

I still feel that way. Perhaps more so. But it is obvious that my timetable is off.

The unasked questions any speaker faces in front of this audience are still the same. There's a softening of business, but we will strain to keep the track in condition. We're coping—to be ready for the future—and if we don't do that when we're carrying record business, when will we? How else can we cope with the increased weights, speeds and traffic levels the experts all predict for the years ahead?

How can we cope?

Some of you may also be asking how we can cope with the rising level of criticism coming at the railroads. The social concerns roused by hazardous materials involved in accidents, rising levels of derailments, inadequate track programs and the compounding public impact of sensational media coverage, are, in my view, speeding up the timetable for the public action needed before we can cope with our private problems. While politicians at all levels can generate publicity by attacking railroads in general—and conglomerate-owned railroads in particular—they cannot alter the ultimate fact that profitable railroads do whatever it takes to keep doing their thing.

That sounds simple.

But it does not seem to be understood by either the media or our political leaders at local, state or federal levels. "Profitable" does not mean making 3 per cent on your investment—and certainly our double-digit inflation underscores the terrible damage being done to railroads.

Adams Smith, in his "Wealth of Nations," expressed it rather well, though it perplexes both railroad managers and media when they hear it. Smith observed that it is the managers' role to "maximize costs."

All costs exist in contemplation of profit. Which, of course, is why Adam Smith felt management's role is to maximize costs—because the greater the costs, the greater the profit. The managers' role is to find the point in the competitive effort where adding—or subtracting—costs *reduces* profits, and then keep the enterprise as close to that point as possible.

Railroad managers have been faced with ruinous increases in their costs (which are *not* regulated and which are heavily determined by inflexible union rules) and inadequate prices (which *are* regulated and heavily controlled by shippers and political interests). They have been active where they *could* effect results—by cutting costs via deferrals of track work, by mechanization to control labor costs wherever such mechanization was possible—mainly in accounting and maintenance-of-way work.

The media and the politicians take issue with both.

Yet, one wonders if they've thought through what they urge, when they insist that railroad income from non-rail property be used to do work that cannot be justified by the railroad industry's shrinking profit margins from railroad operations?

What would you think if a prospective employer asked how much income you have from savings, how much property you own— before establishing your wage rate? What if your railroad gave you high wages if you had little, and low wages if you already had income from interest on savings or owned a home?

Absurd?

You bet.

That, however, is exactly what the media and some critical politicians and labor leaders seem to insist is an appropriate way of looking at the so-called railroad problems. It always seems to surface in stories, statements and articles that imply that all would be well if only the railroads would put money earned from their real estate and other property not used for transportation purposes into their rail plant.

Such ideas, of course, fit hand-in-glove with the populist mood of the times.

Are those who own railroads, because they *do* serve a public need, required to earn less, or to erode their capital, in public service? Why shouldn't super markets, or steel companies, or telephone companies, or farmers, or coal miners, or contractors, or the automobile companies, or private citizens, for that matter—be required to do the same?

The reason is obvious. A serious problem exists—always close to the surface of the Penn Central problem: Can public policy result in the confiscation of private property, without due process of law? It is a problem the Congress—and the public, and the unions—better ponder before the developing railroad problem gives the entire economy of the United States a serious bias toward nationalization, and we all lurch toward the national condition of Britain—or Italy.

The railroads are under wide attack because of their inability to cope, especially with their fixed plant needs. I think this is a tragedy. Engineering Department men have performed heroically during the past two decades, coping with harder punishment to the plant by heavier loads and faster speeds.

The rail industry's fixed plant shows signs of capital starvation in various places—mainly in the East, but also in the Midwest and in some places in the West hitherto assumed to be free of Penn Centralitis. A marked change has taken place in the transportation services performed by American railroads. In 1973, railroads produced a record number of ton-miles. Yet, paradoxically, they didn't carry any *more* tonnage, and carried *fewer* carloads than they did 20 years ago. More work was thrown upon main lines and less upon secondary and branch lines.

Railroads have performed heroically in recent years, and are still helping to hold back inflation by their ability to carry such huge tonnages as unit coal and grain trains do.

Not done without machinery

If it were not for track machinery and new techniques you people have developed, railroads couldn't keep the track in good shape. Railroads generally, and ICG specifically, are investing in right-of-way designed to carry heavy tonnages. During 1974, the ICG will have spent about $115 million on its railroad plant. The major part of that substantial sum will be spent on maintaining our right-of-way along 9,600 miles of main track, about half of which is south of the Ohio River and half north. Capital improvements, such as heavier rail, stronger bridges and better communication devices, account for nearly $23.4 million of that $115 million in our 1974 budget.

Better tools and better techniques help Illinois Central Gulf cope. Today, there are fewer trackmen. But sophisticated track machinery, better communications and better planning help trackmen be more productive.

The details of track work are fascinating to me, but it makes comprehension difficult for outsiders. Good ballast and good ties are essential. Each mile of track calls for about 3,000 ties, and thousands of spikes, rail anchors and tie plates. This year, ICG alone will pull approximately a million worn ties out of track and replace them with new pressure-creosoted ties of oak or southern pine. Ties have become expensive and hard to get. Every railroad installs them carefully, to obtain maximum wear. In some countries steel and concrete ties are used, because of timber shortages. But the territory served by our railroad still produces wooden ties at a more economic price than concrete and steel ties. This year ICG will use 14,000 carloads of ballast to give the roadbed a base to handle increased tonnages with safety. This year our railroad will spend more than a million dollars to remove unwanted vegetation from yards, from under timber bridges for fire protection, and from blocking the view of motorists at rail crossings. These chemicals are approved by the Environmental Protection Agency.

Mechanization of track work has been the key to trying to achieve the impossible. The railroads' track maintenance and improvement programs are highly mechanized. On Illinois Central Gulf, we have almost 5,000 units of track machinery that have cost the railroad about $16 million. The investment of the rail industry in such mechanization is immense. Though much more will be required in the future, it represents an impressive effort, and stands as a mute testament to the fact that rail managers, especially in the Engineering Departments, have performed heroically since World War II, despite declines in the rails' ability to generate enough capital to do the job.

We couldn't do the job today without these machines, is what our Allen Sams, our chief engineer, says. In the historic days of railroading, hundreds of men were involved in building rail lines, mostly by hand labor. Today, mechanized track gangs with 15 or 20 men stretched over a half mile of line may use 10 or 12 different major pieces of equipment to do the same work.

Despite photographs made by newsmen using telephoto lens that distort distance to make track appear wiggly, the industry's new tracks are straighter and truer than ever before. Semi-automatic maintenance work in raising, lining and tamping keeps track in shape to carry the diverse products needed by American commerce and industry. Periodic inspection by rail-testing machines electronically searches out pieces of rail where hidden flaws have developed.

The technology of trackwork today is highly sophisticated. It gives us the ability to make the network of American railroads an indispensable asset to our American economy. On the other hand, there is no question that much work must be done to assure that the industry's track is equal to future demand. American railroads have fought hard to maintain good track standards despite inadequate earnings. We have succeeded as well as we have only because of American ingenuity in mechanizing track work.

Need a regulatory shift

The time has now come when the public, and government, must support railroads. The national system *must* be rebuilt and enlarged for the demands ahead. Such a program calls for a regulatory shift.

The railroads must be regarded as a business—by their employees, their unions, their shippers, their neighbors —and perhaps by their managers most of all. Near-term, railroads must have help. The great sums government has spent on facilities used by other modes of transportation—trucks, airplanes, barges, can no longer be regarded as *promoting* competition. They are now *destroying* competition, by causing the railroads to live off their assets until they either go bankrupt or are nationalized. For the preservation of a free-enterprise economy, for the long term, railroads must have the opportunity to compete on an equal basis with other modes. With these short and long term conditions met, railroads will be America's best transportation bargain in the future as they have been in the past.

Two main questions involving railroads are before the public. Are railroads a business? Is private property in this country private?

A corollary railroad question is whether the public has any responsibility for the regulation and policies that have all-but-laid-low this once great industry. If it does, and if public policy requires railroads, then public policy should restore the railroads, and restore economic equity to the transportation regulation that controls the rail industry's ability to generate capital, so that private property and private capital can once again undertake the immense public task required of railroads. Then this will be the year of the railroads. We know it can happen.

Last year, for the first time, a bill opened up the highway trust fund. Until now, that multi-billion dollar fund has been used only for highways. The $200 million earmarked for mass transit is only one per cent of the $20 billion authorized, but it represents an important victory for the public's need of more than just highways.

Congress is under pressure to write new transportation laws. Now we have a chance, and a good chance, to get action. The passage of the legislation founding the U. S. Railway Association, for the revitalization of the Penn Central early this year was a good sign. The reporting out of committee of the Surface Transportation Act a few days ago is another.

Our nation is expanding and growing—despite the short-term concerns that worry all of us. It must have better railroads. We need the kind of railroads that can carry traffic safely and well.

As I said, the only effective way to achieve that is to get government help to get even, and then to get the rules of the game changed. I have no qualms about our ability to compete, and to compete hard, once we are on equal basis.

The title of my remarks to this group last year was "Light at the End of the Tunnel." Not a very original way of saying it, perhaps, but I think it was an accurate way to describe where we were. We *are* in a tunnel. We *have* been for too long. This year, trying to see where we had been, I could only feel we have traveled some distance through that tunnel, that we are closer to the light than we were before. I honestly believe that. We can reach the end of the tunnel and we can move out. I hope that next year I can come and enjoy the sunshine with all of you. Thank you. (Applause)

President Runde: Thank you, Mr. Boyd, for taking time to speak to us today and give us those words of encouragement. We hope, also, that the light at the end of the tunnel becomes brighter.

We would like you to stay for as much of our program as you can, but realize you may be needed for duties elsewhere, so please feel free to leave whenever you wish.

I now turn the rostrum over to Mr. Autrey.

Introduction of E. R. English

President Autrey: Thank you. Our next speaker this morning will be Mr. E. R. English, regional track engineer of the Federal Railroad Administration in Chicago.

Mr. English was born in New York City and received his early education in the schools of White Plains, New York.

After receiving his B.S. in Civil Engineering from Tri-State College at Angola, Indiana, he entered the Engineering Department of the New York Central.

After holding various jobs on that railroad, and on the Penn-Central, and a stint as engineer, maintenance of way, for the Washington Terminal Company, he was appointed regional track engineer of the FRA, the position he now holds. It is my pleasure now to present Mr. English. (Applause)

Track and Structures—The Present Crisis in the Railroad Industry

By E. R. ENGLISH

Regional Engineer—Federal Railroad Administration

E. R. English

Thank you, Bill.

It is an extreme pleasure for me to be here and have the opportunity to speak to you about some of the serious problems facing the rail industry today and hopefully give you an idea of what we in the Federal Railroad Administration propose to do about it.

If there is one strong undercurrent that we in the field get from Washington, it is this: We are required by law to make sure the railroads obey the law. As you know, one of the prime functions of the FRA track inspector is to review the inspection reports filed by railroad track inspectors. We operate on the basic assumption that railroads don't like train accidents any more than we do. As you also know, track inspection on the railroad also must be done by qualified people, people who have a full understanding of track standards, and these people must be certified.

Washington is aware that we are running into problems. We are still finding, after two years, that railroads cannot produce records that we need, stating that the inspections were made at the required frequencies. We sometimes find records that say things like, "No defects found," or when defects are noted, "There is no remedial action taken." When we make spot checks in the field we have found that many serious defects still exist. We have found that railroads have been operating a line in a Class 2 or a Class 3 speed, but it's really only Class 1, or even substandard to Class 1.

Inspector must be responsible

This leaves the Federal Railroad Administration with several options. The obvious one, of course, is to fine the railroad, or we could close down that stretch of track until it's fixed, but these really don't get to the root of the problem. There is one more option open to us. We feel some responsibility must be borne by the individual or individuals who allow their employer to break the law. Our regulation states quite explicitly that the man who finds the defect has the legal responsibility to either put on a slow order, fix the track, or shut down stretch of track, right then and there. And that's what I said, "the man who finds the defect."

If he fails to do this, he shouldn't

be working in that job. If a railroad sends a man out to inspect track and that man is not fully acquainted with the track standards, then he shouldn't be there. If the inspector notes obvious defects but does no more than inform the supervisor and the supervisor does nothing, then he, too, should be disqualified. The regulations make it clear that the people responsible must have been certified by the railroads. If we find certification to be inadequate, we will not accept certification of that individual.

In short, the Washington office of the Federal Railroad Administration wants to exact a full measure of responsibility from the people who do the actual inspections, and also, the people who supervise that job.

The railroad companies found to be in violation will certainly be subject to civil penalties. We do not anticipate that individuals will have to pay fines but we do anticipate that individuals may be disqualified as certified track inspectors if they fail to do their proper job.

There is no way our track inspectors can assure the American public that the railroad tracks through Small Town, USA, are safe unless we can be sure that the railroads themselves and the people on those railroads are doing the job the law requires them to do. It is the FRA's legal responsibility to make sure the law is complied with, that if railroads cannot conduct adequate inspections with the manpower now on the job, then the railroads will have to hire replacements. We will insist on it.

These are harsh words to be sure, but they are not only my words, but the words from Washington. Inspections must be thorough and accurate and in compliance with the law. The remedial action must be immediate, and sufficient, and again, in compliance with the law. Either slow down the trains, fix the track, or take the track out of service.

Our inspectors can't fix the track for you, but they can close it down. We can—we have—and we will. We no longer have a choice, especially in the face of public opinion.

Some of these remarks I tried to impress upon you a year ago but they evidently fell upon deaf ears.

Several minutes ago I mentioned civil penalties in the forms of fines. I recall last year listening to one of your colleagues saying that the Federal Track Safety Standards had been in effect for one year and up to that time the Federal Railroad Administration had filed only a small number of violations. He also stated there had not been any fines assessed against the railroads. These statements are no longer true. We have collected close to a million dollars in the fiscal year 1974. The amounts involved in track violations are in most cases staggering. One that comes to mind and is now in the process of being handled under the Claims Collection Act amounts to $94,000, and I don't have to tell you that $94,000 buys a hell of a lot of ties.

Track removed from service

The railroads will be subject to these civil penalties as long as they continue to permit the track to deteriorate and in some cases we have found this deterioration has reached the point of no return. If this occurs on your railroad, you can expect the track to be removed from service, and as I said before, this has happened.

In August of 1974, the Federal Railroad Administration had no choice but to order the shutdown of what amounted to all 415 miles of the Penn Central between Chicago, Illinois, and Louisville, Kentucky. As you know, we are required by the Federal Railroad Safety Act of 1970 to establish and enforce safety standards on the nation's railroads. Our standards are admittedly quite flexible. We can allow you to have a rather rotten railroad, if I can be so indelicate, as long as speeds are kept to a minimum over bad stretches of track. Indeed, you need only one sound cross tie every eight feet and you can still limp along at ten miles an hour. In Indiana, however, we found over 1,000 separate instances where the track failed to meet even those minimal conditions for Class 1 track and we had to order a zero miles per hour speed limit until the track had been fixed.

It's conceivable that some people would tolerate this situation if we were dealing with a light density branch line winding out to the boondocks. But this was main line track, track that carried Amtrak trains, track that carried hazardous material, track that passes through cities and towns in the Heartland of America.

Admittedly this track is owned and operated by a thoroughly bankrupt company. Maintenance funds are hard to come by for that company. And shutting down a railroad isn't the way to get the company back on its feet. But we had no choice.

The Federal Railroad Administration is alarmed at the problem and alarmed at the future health of the railroad industry, because we are not thoroughly convinced it is an affliction peculiar only to bankrupt railroads.

Tracks worse than year ago

Our track inspectors, only 36 of them nationwide, report back that all of the nation's railroad tracks seem to be a little worse off this year than they were a year ago. Our economists, looking at rail companies' reports on maintenance expenditures, finds a very real pattern of deferral of maintenance, even on railroads that are normally solvent and successful.

The industry trade press, generally a good barometer, concurs that spending for track maintenance on 25 representative railroads, has fallen sharply behind the generally accepted rate.

A recent issue of Modern Railroads, which I'm sure would like to say good things about the industry, shows that the 1973 spending was off 11% in terms of 1955 dollars.

And it is not just outsiders, in terms of FRA and the trade press who are viewing this situation with alarm. It is expressed by virtually all executives from every major railroad.

The fears of the Federal Railroad Administration are not necessarily those of an alarmist. Railroads in this country, with a few notable exceptions, are beginning to let their systems go to pot. Some are in a more advanced state of deterioration than others. Some of the better lines, of course, are utilizing deferred maintenance as an acceptable way of getting through one year's problems and they have every intention of going back and catching up before the slow orders go out and service deteriorates along with the track. But the number of slow orders is increasing, locomotive availability is falling off, and operating department frustrations are on the increase. All the signs of crummy railroading are appearing all over the country.

All in all, it is a pretty dismal picture. You don't like it any more than I do. Several responses have been proposed. Some say we should hire a whole army of federal inspectors to swoop down on the railroads and order them into compliance or shut them down. Others say we simply need to expand our ongoing program of fining violators. Others say we ought to take over the railroads, lock, stock, and barrel, and run the whole operation the way we run the Post Office or the Pentagon. These are simplistic responses and they are headline getting responses and they are wholly inadequate responses.

They fail to ask two important questions. How do you get needed rail service when systems are shut down? And two, if we do take over the railroad system and turn it into a new and daring government venture, who pays the bill? After all, the fixed plant now in existence is worth anywhere between $50 and $100 billion. I don't think our economy, especially in its present state, would be well served by having the government make a massive purchase of this nature, especially when all we would be doing is buying a problem.

Must be given a chance

No, if salvation is to come to the rail industry, it should come not from the great federal eagle swooping down out of the sky, depositing whatever eagles deposit on the down thrust, but rather, the rail industry has to be finally given a chance to make it on its own, to earn an honest living, pay an honest wage, and to do it at a reasonable profit.

Very simply, the railroad industry needs access to cash and Uncle Sam can help in this regard and do it without buying up the railroads. What is needed and what has been proposed is a revolving account of $2 billion worth of loan guarantees to the industry. Railroads, as you know, cannot go to the money market today to borrow large sums of cash that are needed for rebuilding and revitalizing the industry. The money lenders, and very properly, do not deem our industry a very good risk. But if those loans are guaranteed by the government, a cosigner of the notes, so to speak, the security of the lender goes up and the interest rate drops sharply.

This money, along with a 10% rate increase under expartee 305, should start the rebuilding process off on the right foot. As the plant is improved and the service gets better, operating economies thus achieved will make the railroads more viable. As they become more viable we will begin to get back to where the railroads were a couple of decades ago and the government can be reasonably assured of the repayment of the loans. We will insist, of course, that the proceeds of the loans be used exclusively for the improvement of transportation services, equipment and facilities.

At the same time, our legislative package calls for substantial modernization of regulatory procedures. Most all reasonable participants in this debate recognize the competitive situation has changed since the last major revision of the Interstate Commerce Act and that things like the interstate highway system, jet airplanes, the development of inland waterways, and a national determination to conserve fuel resources, must all be read into a new equation of how the railroads go about serving their potential customers.

I can't say today precisely what changes may come about but we are sure that the atmosphere in Congress and in transportation, as well as among shippers, is such that some change will be achieved. We have reached the point where any change is a plus. The railroad industry cannot survive when it earns a government regulated 3.2% return on investment, and change will come, hopefully before your next convention. Some legislation will have been signed into law. And, believe me, it won't be a moment too soon.

In closing, let me say just one more thing. The Federal Railroad Administration knows very well that most railroads are doing a good job and that many railroads have lots of very good track. We know that you want to do a good job and we know the difficulties that some lines are experiencing in coming up with the wherewithal to do a top job. The kind of track we were talking about and the kind of laxity we were beginning to notice is at locations you were well acquainted with. You know where it is on your railroad. You know how to inspect it properly, you know how to classify it, how to operate over it, and how to fix it. We just want to help you get the job done—and done right. Thank you. (Applause)

President Autrey: Thank you, Mr. English.

It is certainly true, as Mr. English has said, that we don't like accidents any better than FRA or anyone else does and we on the railroads certainly want to do a good job and I think we are trying to do a good job.

I think FRA has a very difficult job and I think we must work together in order to accomplish our goals. We may not always agree with some of the FRA people whom we are dealing with, but as Mr. English has told us, the law is real and we do appreciate him coming here this morning to share his views with us. Thank you, Mr. English.

Now, Mr. Runde.

Introduction of Mr. Durham

President Runde: At this time I would like to present Mr. L. A. Durham, Jr., Chief Engineer, Norfolk & Western Railway, who will show and tell us all about a new line construction project recently completed through some very rugged country in West Virginia. Mr. Durham.

Our Toughest New-Line Construction Project

By L. A. DURHAM, JR.

Chief Engineer, Norfolk & Western

L. A. Durham

Thank you, gentlemen.

In July of 1974 the Norfolk & Western Railway Company completed a railway and highway relocation project on the New River division of the Pocahontas division in Mingo and Wyoming counties of West Virginia.

This relocation was necessitated by a United States Government flood-control project on the Guyandot River, known as R. D. Bailey Lake.

The project was authorized by the Flood Control Act of 1962 on flood control, general recreation, fish and wildlife and water quality control. And it is under the jurisdiction of the district engineer, U. S. Army Corps of Engineers of Huntington, West Virginia.

It is currently estimated to cost $127 million, of which $53 million was the cost of relocating the railroad.

The Guyandot River rises in the foothills of the Cumberland Mountains in Raleigh County, West Virginia. It is formed by the junction of Winding Gulf and Stone Coal Creeks and follows northwesterly through Wyoming, Logan, Lincoln, and Campbell Counties to the Ohio River at Huntington, West Virginia, 304 miles below Pittsburgh, Pennsylvania.

The total fall on this river in a distance of 167 miles from head to mouth is 1,093 feet. The difference between low water and high water elevations on the river is about 23 feet at Manns, West Virginia, which is 19 miles below the new dam.

The Guyandot River basin contains a large portion of one of the greatest bituminous coal fields in the country. Exploration of this field has just barely begun, even though coal production has been the predominant activity in this area for many years. Most of the coals are the high quality, metallurgical, domestic, steam and by-products types. And it has been estimated that the annual rate of production yet reached can be maintained for 300 years.

The dam site is located 1.3 miles northeast of Justice, West Virginia, or about 112 miles from the mouth of the river, with a maximum flood elevation of 1,355 feet, and extends approximately 22 miles upstream on the Guyandot River to a point near Marianotta, West Virginia, also extending up Cub Creek about four miles and up Clear Fork Creek about three miles.

This reservoir will cover about 2850 acres and will have a seasonal pool elevation of 1,035 feet, covering about 630 acres.

The dam will be approximately 325 feet high and will be of rock fill construction with 2-foot concrete slab on the upstream face.

This is not a very big lake to spend $53 million to relocate a railroad for.

The Norfolk & Western Railway Company's track in the control project area generally follows the Guyandot River and is called the Guyandot River branch.

Two other branch lines serving coal mines in the area connect with the Guyandot River branch. The Cub Creek branch runs about 7 miles from Coal Mountain, West Virginia, along Cub Creek, and the 19-mile Morri Branch runs southwesterly from Cockeston, West Virginia, into Clear Fork Valley, to connect with the Guyandot River at Simon, West Virginia.

An engineering feasibility study was prepared in 1964 by Sverdrup & Parcel & Associates, consulting engineers in St. Louis, Missouri, for the Corps of Engineers to determine the most economical and feasible route for the replacement of rail facilities which would be inundated. Consideration was also given to a route that would cause the least interference to railway customers and to the general public.

Six routes are studied

Six possible routes were studied for the relocation of the Guyandot River branch between Gilbert and Baileyville, West Virginia. The selected route which was constructed generally detoured around the central reservoir and returned to the main line up creek from Cub Creek Junction to afford connection to the Cub Creek and Morri Branch.

The constructed route for relocation involved the abandonment of 15.6 miles of the Guyandot River branch, 4.3 miles of the Cub Creek branch, and 1.9 miles of the Morri branch. In addition, 5.8 miles of sidetrack were abandoned, resulting in a total of 27.6 miles of abandoned trackage. These abandonments required the construction of 16.4 miles of Guyandot River branch main line, 5.9 miles of Cub Creek branch, 2 miles of Morri branch, or a total of 24.3 miles of track. Approximately 7.9 miles of new sidetrack was constructed. Resulting in a total of 32.2 miles of new trackage.

It was also necessary to raise in place approximately .7 of a mile of the line at the tying points to the old lines, with an average track raise of 1.4 feet.

In order to expedite this work, the Corps of Engineers entered into an engineering contract in June, 1965, with Sverdrup & Parcell for preparation of preliminary railway and highway alignment and soil profile for the relocation and for a portion of the state highway relocation.

Subsequent design contracts were entered into with S. & P. by both N & W and the Corps.

A total of 1,290 construction drawings, along with appropriate specifications were required for this relocation.

The railway company's Board of Directors at its meeting held in March, 1967, authorized the officers of our Company to enter into a contract with the United States of America covering the abandonment of the above mentioned facilities and the railway's adjustment and relocation of its facilities necessitated by the reservoir project.

Completion dates are changed

Initially our contract with the government called for diversion before June 30, 1971. The date changed several times, however, due to alternate design studies to effect savings in construction projects, and inadequate appropriation of funds by the federal government for planning and construction in several fiscal years. And, thirdly, contractors not completing the work on time.

In December, 1971, the railway company was advised by the Huntington District Corps of Engineers the rail traffic must be diverted no later than July 1, 1974.

The roadbed construction for the railroad relocation work, together with the associated highway relocation, was apportioned into 12 segments for contract parcels. However, as work progressed some of these segments were combined and a total of 7 contracts were let by the Railway Company for roadbed construction.

Approximately 10 miles of railway relocation adjacent to the relocated railway lines were included in the Railway Company's grading contracts.

The first contract was awarded to Mountain States Construction Company on June 9, 1967. The contract was for constructing a concrete lined tunnel 1530 feet long and the approach roadbed to subgrade.

Subsequent grading contracts were let, the last one being awarded on December 7, 1971.

The entire relocation was under the direct control of the Engineering Department of the Norfolk & Western Railway Company, subject to acceptance by the Corps of Engineers.

The Norfolk & Western entered into another contract with S & P for engineering services for construction and inspection at a cost of approximately $3 million. Members of my staff were on the site throughout the construction to coordinate the work with the Corps of Engineers and consulting engineers. S & P also provided engineering inspection services under the contract for track and signal construction.

Roadbed construction contracts totalled approximately $37.8 million and included 11.6 million cubic yards of excavation, four concrete lined tunnels with a total length of 9362 feet, 14 concrete and steel bridges, totaling 4,021 feet in length, and 14 reinforced concrete box culverts, the largest of which is 13 feet by 12 feet.

The longest and highest bridge is located at mile post 0.8 on the Cub Creek Branch, where it crosses the flood pool. This bridge is 751 feet long, with the base of rail about 175 feet above the present stream location and will be 160 feet above the seasonal pool.

The N & W had originally contemplated the construction of the track and signal work with its own forces. However, in mid-1972 it was decided to contract the work due to the unusually large number of construction projects under way, together with heavy maintenance program work on the system.

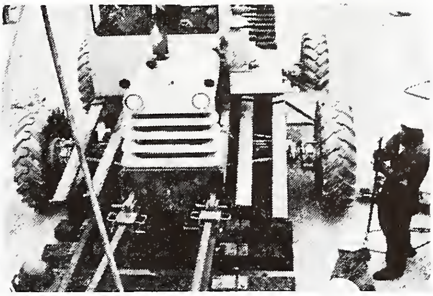
Material purchases were under way at that time and we felt it desirable for the Railway Company to furnish all the materials necessary in the construction of track and the signaling system.

Arrange for welded rail

The abandoned tracks were constructed of jointed rail but we desired continuous welded rail on the main track and passing siding of the relocated branch lines. Arrangements were made with the government for this with the N & W bearing the additional cost of welded rail over the jointed rail.

Inasmuch as the government obligation would provide only a substitute facility of a kind, both the Railway Company and Corps of Engineers made extensive inquiries for the purchase of rail of comparable quality and weight existing on the abandoned line. But we were only able to find about four miles of fit 132-pound rail, which was welded and used in the main line of the Morri branch and the Guyandot River branch.

It became necessary to purchase welds and install approximately 16 track miles of new 132-pound welded rail in the Guyandot River branch line and the 110-pound welded rail for the Cub Creek Branch which was made available by the Norfolk & Western. The branch line does not carry very much tonnage.



STRADDLE AXLE Speed Swing pulled stringers off the rail train.

The material cost of the track and signal communication facilities for the relocated lines were approximately $3.8 million, requiring 32 track miles of rail, 90,000 cross ties, and 2800 cars of ballast.

The three relocated branch lines were constructed with a maximum 10° curvature. The Guyandot River branch has a 1% compensated grade, and the Cub Creek and Morri Branches are virtually level.

The Guyandot River Branch was designed for a maximum authorized speed of only 30 miles an hour because there are nineteen 10° curves on the main line. The two secondary branch lines have authorized speeds of 25 miles an hour and there are an additional eleven 10° curves on the branch lines.

As previously mentioned, continuously welded rail was installed in the main line track and the previously relocated branches with 1320 feet and 1440 feet ribbons used. Continuous welded rail was laid on all ground track and installed on bridges, having a total length of 300 feet or less and a curvature of 3° or less, or having a total length of 50 feet or less and a curvature of 3 to 6°. In other cases, 78

RAILROAD FORCE installed the track on the existing right of way. It was impossible to divert traffic until the entire project was completed.

foot welded rail was installed on the bridge.

During the initial construction, 5 inches of compacted sub-ballast of crusher run stone was provided, with 4 inches of standard stone ballast applied on the sub-ballast in two lifts.

The railway company's contract with the government provides for a 5-year deferred construction period immediately after relocated lines are placed in normal operation. During this period provisions are made for additional 4-inch track raised with standard stone ballast to be made in two 2-inch lifts.

Railway company forces did undertake the installation of the track located on the existing right-of-way, including the tying points and end new track raising.

Due to the wide separation, grade, and location of the relocated lines with the abandoned lines, it was impossible to divert rail traffic to relocated lines until the entire project was completed. In March, 1973, the N & W publicly advertised for bids for the construction of the new track, including installation of traffic control signal systems on the Guyandot River Branch on approximately 25 miles of signal and communication pole lines. Five bids were received on April 24th and all were rejected for being ridiculous in price.

The work was readvertised and we were successful in placing the contract for labor for installing the track, traffic control signal systems and pole lines, which was awarded on June 9, 1973, to a joint venture consisting of the Morrison-Knudsen Company, Inc., Rail-Co, Inc., and a joint venture partnership composed of Gross-Hanson & Peterson and the Osho Construction Company, all of which operated under the true name of Morrison-Knudsen, Inc., and Associates. The contract provided for completion in 320 calendar days.

Ties are pre-plated

The contractors set up plants for pre-plating ties at three locations during construction. The pre-plated ties were hauled to the grade in trucks and lined and placed on the roadbed. Roller bearing rail rollers were placed on the cross ties at approximately 30-foot intervals to minimize resistance and maintain constant accurate alignment when the continuous welded rail was pulled off the rail train through a transition car to the ties on the grade by a straddle axle Pettibone Speed Swing.

After the application of angle bars, the contractor proceeded by shoving the rail train ahead at approximately one mile an hour, spiking every fifth tie on a tangent and an additional spike on short curves as necessary to hold the rail.

Following the rail train the spiking was completed and then the rail was anchored within specified temperature ranges.

The application of insulated joints and field welds were kept behind the anchoring units. After anchoring, the sub-ballast was dumped and regulated to give a uniform spread prior to the use of the auto sled with hydraulic compaction.

This was followed by the first dump of ballast.

Pole line work was kept well ahead of rail laying and the signal system subcontractor installed the signaling after track was laid and the first lift of stone ballast was done.

Initially the contractor's work proceeded at a slow pace due to abnormal weather conditions and other matters that would lead to justifiable contract time extensions.

The railway company was advised in January, 1974, that the Huntington District Corps of Engineers had committed to having traffic diverted over the relocated lines on or before July 1, 1974. That information had been relayed to Congressional representatives and higher headquarters and to the public on several occasions.

In addition, the Corps awarded a contract in late 1972 for construction of the dam, outlet works, and appurtenances on the basis the river could be diverted through the outlet work in July of 1974. On March 1, 1974, about 40% of the contract for track laying had been completed and our contractor was placed on an accelerated schedule with reimbursement on a direct cost-plus basis. It called for completion no later than June 15, 1974. This resulted in approximately a $4 million total cost for labor, installing track, traffic control, signal system, and pole lines.

The contractor was cooperative in progressing the work on an accelerated schedule basis and was able to complete it in time for the Norfolk & Western to divert the traffic on June 29, 1974.

This project involved the most difficult construction conditions the Norfolk & Western has yet encountered. The 32.2 miles of new trackage and highway relocation, costing $53 million, will attest to the difficulty. Seven years were required to complete the track and highway relocations from the time the railway company entered into a contract with the government. The remoteness of the area made it most difficult for the contractor to keep personnel and there were many turnovers. Inadequate appropriations by the government also aggravated the conditions.

Our new line is .8 mile longer than the old line and the ruling grade westward is plus 25% while the old line had a ruling grade of 1.75%, which represents an increase in the ruling grade for western movement of 1.5%.

The ruling grade eastward increased from .69% to 1.0%.

The new line has 57 curves. However, the old line had only 36. But the total length of curves on the new line was reduced 3 miles over the length of curves over the old line.

The continuous welded rail was welded in our welding plant at Bellevue, Ohio, and transported to the site on Norfolk & Western rail trains. Steel welds were made, thermit welds, and I will show you pictures of this sequence shortly.

Some switches were paneled, while others were constructed by conventional methods.

Ballast was transported in railway company cars and work trains on the new area were handled by our locomotives which were leased by the contractor and operated by their crews.

Prior to this project, we had a restriction on welded rail. We did not lay continuous welded rail on any curvature of over 6 deg. We had laid welded rail on 30 10-deg. curves on this project and we may consider the use of welded rail on even sharper curves in the future if we have success with this.

Buy old trackage

The railway company was successful in purchasing the old trackage and bridges from the abandoned lines from the government and we are now soliciting bids to have this track and bridges removed by a contractor. The old line was part of the Virginian Railway, which merged with the Norfolk & Western in 1959 and the bridges were very sturdy. They were designed for E-75 loading. So needless to say, we will make good use of these spans.

I shall conclude by showing you some colored slides, which I hope will emphasize the difficult conditions under which the project was completed.

The black line towards the bottom of the screen is the diversion or detour away from the reservoir for the new line.

This is a slide showing the Guayandot River basis. At the top you will see the Ohio River, and Huntington, West Virginia, is at the top of that. You will see the R. D. Bailey Lake down at the lower part of the slide.

This is a photograph of the line under construction. You can see a tunnel under construction on the right and heavy rock cutting on the left.

This is a tunnel under construction.

This is the completed tunnel. There is a highway under this bridge, and the tie deck is on the bridge awaiting the rail.

This shows you the nature of the rock cutting and the benches. There is a tunnel in the background.

Slide detector fences will be erected on this line. We are having a rhubarb at the present time with the Corps of Engineers. They don't want to pay for all of them.

Our main line goes through the tunnel and the Cub Creek Branch takes off to the right. That tunnel is also concrete lined.

This is a photograph showing form work inside the tunnel.

This is typical roadbed construction.

This is an air view showing typical construction.

A photograph of another tunnel.

The tunnel portal you see in the upper right hand corner of the picture is the main line and the work on the left is the actual diversion tunnel for the Guyandot River for the construction of the dam.

This is one of the railway bridges being constructed over Route 52 at

Justice, West Virginia.

This is an air view of the same bridge and the road bridge. This is at Justice, West Virginia.

At the top of the photograph, if you will look at the rock bluffs in the background you will see what difficulties we had in shooting that rock that close to an inhabited town.

This is another photograph of the same bridge at Justice.

This is the area immediately behind Justice, West Virginia, above the Guyandot River.

This is an air view of a new tunnel under construction and if you will look at the lower left-hand corner you will see the old line down below.

This shows the one segment just after it was cleared, before the grading was actually commenced. You can see the old line off to the left.

Again, this is a photograph of the main line under construction and the old line off to the left across the river.

A similar scene of the old line down below and the new main line up high.

Rock pinnacles are a menace

Those rock pinnacles that you see at the right gave us a great deal of difficulty and resulted in a lot of overbreakage and extra shooting.

Another photograph of the rock excavation.

That bluff you see in the background, we now have the railroad on it. The next slide should show you that railroad. In the lower right-hand corner is the old line, down below.

That's the beginning of the Cub Creek Branch. The tunnel on the left side of the photograph is the main line.

A general view showing the terrain.

Here is another of those pinnacles I spoke of. They are very dangerous. You don't know when they are coming down. And, of course, we had to take them down when they were above the right-of-way. The road below is temporary.

The new line will be on the right and the old line on the left.

This is a photograph on the Cub Creek Branch. The roadbed for the railway is up on the rock shelf and the relocated highway is down paralleling the river.

This photograph shows the roadbed on the right and the highway and the old line on the left.

This is another photograph of the first bridge on the Cub Creek Branch, 751 feet long and 175 feet above the water.

This is another photograph of the same bridge.

The same bridge—and you will see the old line off to the left.

This photograph was taken from the new highway bridge, which is equal to the height of the railway bridge.

Another view of the branchline and highway relocation.

This, too, is another photograph on the Cub Creek Branch and highway relocation.

This is the same thing.

This is a photograph on the Cub Creek Line and shows you the hazardous conditions under which the excavating crews worked.

The roadbed under construction.

This is on the main line and is one of the areas that has been subjected to some minor sliding and we will have slide fences installed.

This is a box culvert under construction with the old line on the left. This is near the extreme east end of the diversion.

This is one of the bridges under construction.

That's a rock fill carrying the main line.

More roadbed construction, with the old line off to the right.

More roadbed construction.

This is an air view of the tunnel and diversion tunnel for the river at the site of the dam.

A photograph of Justice, West Virginia. The contractor filled up the river nearly every time he made a shot and the Corps of Engineers were right on his back. They wouldn't let him proceed until he had cleaned it out.

Again, this shows the rugged country through which this railroad was built.

You can see the old line off to the left.

This photograph shows the high bridge on the Cub Creek Branch and the highway bridge, also, in the foreground.

We employ ballast also on the tunnel section, as you can see, and concrete floors. Our signal lines, communication lines, are run through the conduit placed in the tunnel wall at the right.

Another air view of dam, showing the tunnel.

An air view of the entire town of Justice.

In the background you will see our main line—rather, in the foreground. Our main line has gone through the tunnel, and has gone over to a junction. The track you see going off to the upper left is the Morri Branch.

Here is another photograph of the junction of the Morri Branch with the main line. The main line runs from right to left across the bridge.

This is track construction sequence used by the contractor. Some pieces of the machinery were not used but in general that is the way he went about it.

As I mentioned in my talk, we used some panel turnouts while others were built in the field.

We preplated ties and hauled them to the site in trucks. We ran a test to determine if we were getting a better job with the preplated ties and we found we were. We have a little car that measures gauge and cross level and we suspicioned we were getting a better job with the preplated ties and we built some of the track using the conventional methods and ran the car over it and it proved we were getting better alignment and gauge on the rails by preplating.

That five inches of sub-ballast was placed on the grade and, of course, later would be compacted hydraulically with the autosled.

This is one of the rail shoes we used to guide the rail.

This shows the bridge ready for the rail.

Getting ready for the rail.

This shows the rail train on the Cub Creek Branch.

Another photograph of the rail train.

This is one of the metal plugs or shims we used in laying welded rail.

We heated the rail because some of the rail was laid during cold weather.

This is a sequence showing the Orgotherm weld.

This is a photograph of the autosled in action. We broke the rail on three different occasions using that sled. If you have any faults in the track, that will find it.

You can see the hydraulic compactor unit on the left side there. This unit was towed by our locomotives.

That is a shot of this hydraulic compactor. You can see the portion at the left where it is being compacted and I might add it did an excellent job.

This is a switch heater of the type we use in that part of the country.

This is another view of the switch heater.

This is an M & L rail loader which we installed on this line.

Another view of the welder.

This is a view of the finished railroad.

That's the branch line.

Another view of the rail train working.

Another view of the sled.

Another rail loader.

This is the main line. The one off to the left, across the bridge, is the Morri Branch.

This is the main line and passing siding in the yard track.

This is the main line.

Also on the main line.

This will give you some idea of our problem with falling rock and calling on the requirement for slide fences.

This is a little machine I told you we made in our shops. It measures gauge and cross level, which we ran over the track prior to acceptance.

This is a view of the printout inside the machine. We used this machine almost continuously and it gives the roadmaster the tapes so he can make any corrections.

This is a photograph of the first train over our new line. That is a Southern Railway System steam locomotive pulling a rail buffs excursion trip and the locomotive leading the train, we had to put that on to assist the steam locomotive on some of the grades. It is painted red, white, and blue to celebrate our nation's birth.

I want to thank you for letting me share your program with you. It has been a real privilege for me to appear. (Applause)

President Runde: Thank you, Mr. Durham. I'm sure all present will agree that was indeed a tough new line construction project.

I wonder if anyone in the audience has any questions they would like to ask Mr. Durham?

Mr. Dove: Did you run through some coal seams?

Mr. Durham: A few coal seams, but not many.

President Runde: Any further questions? If not, thank you again, Mr. Durham, for a very interesting presentation.

At this time, I was supposed to announce the registration as of now but we have lost our lines of communication. But I would like to repeat that as of five o'clock last night there were 332 roadmaster members, 157 associate members, and 319 guests, for a total of 808.

And the B & B Association had 111 members, 25 associates, and 129 guests, for a total of 265.

There were 159 unclassified registrations, for a grand total of 1232. We are also informed that we have registered guests from Australia, Brazil, South Africa, England, Mexico, Austria, Argentina, Rhodesia, France, and Venezuela.

There will be no program this afternoon here at the hotel, and you are all invited by REMSA to visit the exhibits at the International Amphitheater. Free bus transportation is available, as Mr. Martin told you, at the Monroe Street entrance to the hotel.

Right now would be a good time to register if you have not already done so. You may do so out in the lobby.

We will meet again here tomorrow morning in joint session at 8:30 A.M. And until about 9:45 A.M. Then we will reconvene into separate sessions. The Roadmasters will meet here in the Red Lacquer Room. The B&B Association will meet in the Adams Room on the sixth floor.

Do you have anything to add, Mr. Autrey? If not, this session is recessed until 8:30 tomorrow morning.

. . . Recessed at 11:22 A.M. . . .

MORNING SESSION

Wednesday, October 2, 1974

The Wednesday morning Session, October 2, 1974, was called to order at 8:40 o'clock, President Autrey presiding.

President Autrey: Will the meeting please come to order.

For your information, the registration as of five o'clock last night in the Roadmasters Association, we had 476 members registered, 220 associates, and 804 guests, for a total of 1500.

In the B & B Association, 135 members registered, 30 associate members, and 179 guests, for a total of 344.

We have 52 foreign registrants. And all of this adds up to 1896 people. A very good registration. There are others registering today, so it looks like we may go over the 2,000 mark.

We also have 150 ladies who have registered.

The foreign registrants whom I mentioned came from Australia, Brazil, South Africa, London, Mexico, Austria, Rhodesia, France, Chile, Venezuela, Germany, Malaysia, and Argentina. I don't know whether this is a record or not but it certainly is a good representation from all over the world. If we have some of those foreign guests with us this morning, will you please stand so that we may see you and recognize you? (None) Well, we had a couple who registered this morning and we felt sure they would be with us. Anyway, they have been here and they are visiting our Associations.

On the program I might mention that your printed program shows we will have a recognition of the Past Presidents of each Association in the Joint Session but we have decided it would be more appropriate to do this in the separate sessions, so we are going to postpone the recognition of the Past Presidents until we meet in the separate sessions. Mr. Runde.

President Runde: As you recall, yesterday I introduced the members of the B & B Association and quite a few of them could not be here because of their duties. Most of them have turned up this morning and at this time I would like to introduce them. I would like each to stand as his name is called and please withhold your applause until all have been introduced.

At my extreme right is Mr. McMaster, engineer, facilities & structures, B & L E. Railway, who is a Director.

Mr. O. C. Denz, supervisor, building maintenance, Milwaukee Road, a Director.

Mr. W. E. Brakensiek, bridge engineer, Missouri Pacific, a Director.

Mr. W. R. Hyma, bridge engineer, Systems, Santa Fe, a Director.

Mr. C. A. Hughes, assistant engineer, bridges, Southern Pacific Transportation Company, a Director, but he could not be with us today.

Mr. J. W. Davidson, assistant director, bridge engineering, Burlington Northern, a Director.

Mr. W. C. Sturm would be the next gentleman. Apparently he has become messed up in some of our Chicago traffic. Wally is a senior designer with the E. J. & E. Railroad and is a Director.

Mr. W. S. Stokely, construction engineer, Illinois Central Gulf Railroad, a Director.

Mr. D. C. Gould, assistant structural engineer, Union Pacific, a Director.

Mr. W. H. Huffman, retired assistant vice president and chief engineer, Chicago & North Western, is our Treasurer.

Mr. W. H. Rankin, Sr., structural engineer, St. Louis-San Francisco, and is our 3rd Vice President.

Mr. J. R. Williams, engineer, bridges, Rock Island Lines, our 2nd Vice President.

Mr. J. J. Ridgeway, director, engineering services, B. & L. E., is our 1st Vice President.

You may now applaud. (Applause)

The next gentleman will be introduced a little later in the program.

I will turn it over to Mr. Autrey.

President Autrey: We also have some of our Directors here this morning who were not here yesterday and I would like to introduce those at this time.

Beginning at my extreme left, Mr. Hank Hahn, director of public works, engineering, Chicago & North Western.

Next, we have Mr. Bob Dove, who is associate editor, Railway Track & Structures, and does a great job for us every year in getting out the Annual Proceedings.

Next, we have Mr. A. C. Parker, chief engineer, maintenance of way, L. & N. Railroad, a Director of the Roadmasters.

The next chair is vacant. It was to be occupied by Prof. W. W. Hay, professor of railway civil engineering at the University of Illinois. Hopefully, Dr. Hay will show up a little later.

Next, we have Mr. M. S. McClendon, general roadmaster, system, the Frisco.

Next, Mr. Al Barr, engineer, maintenance of way, Penn-Central.

Next, Rus Frame, district engineer, Southern Pacific, and a Director.

Next, Mr. Frank McGuigan, construction engineer, Missouri Pacific, and a Director.

Next, Mr. W. H. Johnson, general roadmaster, SCL, 1st Vice President of the Association.

You may now applaud. (Applause)

The next gentleman we have at the platform this morning is president of the Illinois Northern Railway and operating vice president for the Santa Fe, Mr. Larry Cena. (Applause)

Introduction of John S. Reed

Our first speaker today is an admitted rail fan. He has been interested in railroads ever since his family took him out west on the old California Limited when he was still a boy.

As a teen-ager, he and several buddies jointly owned a Stanley Steamer that they converted into what looked like a steam locomotive and reportedly scared the wits out of a few good Chicagoans who happened to meet it on the street.

After he graduated from Yale, he applied for work on the Santa Fe as a locomotive fireman, at which time Art Vince, chief mechanical officer, is reported to have told him that, and this is a quote, "There has never been a Yale man who has been man enough to fire one of my steam locomotives."

So they put him to work in the Test Department, working on a rail detector car.

During World War II he served on destroyer duty with the U. S. Navy and was released in 1946 as Lieut. Commander.

After the war he returned to Santa Fe and rose through the ranks of the Operating Department as transportation inspector, trainmaster and superintendent, before he returned to Chicago in 1954 as assistant to vice president.

He became executive assistant to the president in 1957 and vice president of finance in 1959, vice president of the Executive Department in 1964, president in 1967, president and chief executive officer in 1968, and since 1973 has been chairman, president, and chief executive officer.

He has always been an advocate of good maintenance-of-way.

It is a pleasure for me to introduce a man who is a believer in what you and I are trying to do—my boss—Mr. John S. Reed. (Applause)

Trends and Influences at Work In the Railroad Industry

By JOHN S. REED

Chairman and Chief Executive Officer, Santa Fe

John S. Reed

Thank you, Bill Autrey, and fellow members of the two associations who are gathered here today.

It is a special pleasure for me to have the opportunity to meet with your Associations again today because I know of no other group of railroad managers who are so close to so many of the day-to-day challenges facing our industry. It is, after all, the third of a million miles of roadbed and track of which you are the custodians which give our industry its name. Today you have your share of problems—some of them more or less aggravated versions of the type you have always faced—but others of a much more perplexing and complex type that tend to baffle solution. Yet if the problems of you who build and maintain our trackage cannot be solved, no number of new locomotives or rolling stock, no changes in rates, no advanced computer applications, and no speeches by railroad presidents are going to produce a prosperous future for the railroads.

I know that some of these more frustrating problems are being attacked in a very sophisticated manner by such programs as the Track-Train dynamics projects in California and at Pueblo, Colorado, and at the test-track section located on the Santa Fe out in Kansas. However, I also realize that many other matters of importance are being discussed at your meetings this week and it would probably be more productive for me to sit and listen to you rather than for you to hear from me. Over the years, I've found that if I really want to know what's going on on the railroad I'd better get out to where I can hear what roadmasters, trainmasters, foremen, and chief clerks have to say. Because they are out where the wheels are turning, they are often in a position to see the immediate operating situation much clearer than someone who is removed from the action.

Often when called upon to make a decision in Chicago that may have to be carried out by a division engineer or roadmaster in Winslow, Arizona, or Clovis, New Mexico, I worry about how the instructions are interpreted and understood. We sometimes have the same trouble in communications that Abe Gibron of the Chicago Bears experienced last Sunday. Those of you who saw the game will recall that through some "foul-up" in communications, the coach simply could not get his team to understand what plays were to be run during the last two minutes of the game. As a result, the Bears stood around in confusion and lost a golden opportunity to win a last minute victory. Their predicament was surprisingly similar to the old football story that I recall from my college years. Football joke—ending "I was thinking I had to be playing for the dumbest damn coach in the country.")

As that little story points out, sometimes it's easy to have your thoughts misunderstood when you do a lot of talking. But that's a risk I'll have to take today since your program calls for me to speak even if I might end up sounding like "the dumbest coach in the country."

Actually, I found it very difficult to decide exactly what I should talk about today. I can't tell you much you don't already know about present rail operations. It has been said by some people that railroad officers shouldn't be wasting their own time or that of their listeners talking to each other about our problems, but that they would instead be spending their efforts more fruitfully in talking to outside groups and spreading the gospel where it is so badly needed. This idea has some merit, but I don't fully agree with it because I think that a group such as yours is also a most valuable forum, and there are perhaps certain areas of our business with which you are not too familiar due to your close attention to day-to-day operations. So I feel that if I can share a few thoughts with you as to the trends and influences at work in our industry today, touching on some of the bright spots and dark spots, perhaps each of you can become a somewhat more effective spokesman for the railroad industry in your associations with people in your communities.

At the outset, let me say that for three days out of the past ten, I have undergone the unusual experience of hearing the collective woes of the entire American economy as expressed at the President's conferences on inflation. If we railroaders think we have troubles—as indeed we do—I can assure you that we have lots of company. At a time when the country doesn't really know where it is heading, every business enterprise seems deeply troubled in its attempt to determine how it can continue as a viable business. To compound the problem, there seem to be about four remedies offered for every economic ill.

Well, let's take a look at the bright side of things in our own business. On the brighter side, I see the following:

Most efficient user of fuel

(1) First there is the dual role the railroads will play in solving the nation's energy crisis by being a transporter for the growing coal industry, as well as being the most efficient user of fuel of all the overland carriers of general commodities. For a great many months, in interviews and talks to public groups, I have endeavored to stress this role of the railroads as conservers of energy, but in recent weeks, prompted by the temporary easing of the fuel crisis, there has appeared to be a public de-emphasis and loss of interest in energy. After hearing the conclusions and recommendations of many leading economists at the recent Summit Conferences, including the public plea for energy conservation made by the President himself, I think that the energy saving role of the railroads will once again come to the fore. It was made perfectly clear at the Conference that the campaign on energy conservation is essential to solving inflation. It was also made equally clear that fuel saving is vitally needed to relieve America's dependence on the Middle Eastern oil producing nations and to assure survival of this country's position of world

leadership.

It was gratifying to me to hear at the Conference frequent urgings that this nation should return to basic fundamentals. Perhaps the reason this pleased me was that this theme jibes so neatly with Santa Fe's own television commercials, in which we proclaim the theme that railroading itself is a **return to basics**—the basic economy of the flanged steel wheel on the steel rail, without which we would not be in business at all. This carries the suggestion that if railroads didn't exist today they would soon have to be invented. Most of us who have seen the abuses and burdens heaped upon the railroad industry in the past 50 years realize that if it were not for our basic efficiency we would have long since disappeared from business. As it is, I think we can all take comfort and encouragement in knowing that when it comes to fundamentals we are on the right team.

(2) The second encouraging item that I observe is the significantly improved relationship with the railroad unions at both the national and the local level. This is something that has been worked at by both sides and it has allowed us to exchange constructive views on a number of important subjects. Most importantly, it has enabled us for the first time to make progress toward gaining the support of our unions on non-controversial legislative matters, the enactment of which, by improving the lot of the industry, inescapably acts to improve the welfare of our employees as well. The most timely examples of this kind of cooperation are found in our joint efforts to enact amendments to transportation legislation as exemplified in the so-called Surface Transportation Act, and, more dramatically, in the recent passage by spectacular majorities of legislation to modernize the Railroad Retirement law. At long last we are getting a feeling of all being in the same boat, with a vast community of interests between employers and employees.

(3) Thirdly, there is some indication that the industry is holding its own in attracting its share of the transportation market. As the need for transportation grows in the remainder of this century, the level of railroad business should continue to rise, at least to the extent that the laws of economics are permitted to operate.

(4) There is, I believe, a resurgence in interest in railroad careers. We are attracting bright young men and women with the enthusiasm, education and interest that bodes well for our future. I would re-emphasize women. While railroads have long been substantial employers of women, they have admittedly been predominantly used in clerical and secretarial jobs. Now we're experiencing a sharp increase in the number of competent young ladies who are capable of occupying responsible positions in such diverse fields as marketing and sales, environmental and technical matters, and real estate development. In the more down-to-earth matters, we also employ women as switchmen and trainmen, and at this date on the Santa Fe I am pleased to say that we have several women locomotive engineers and they are doing a fine job.

(5) Lastly, there are some recent signs, albeit perhaps temporary ones, that many railroads are slowly creeping back toward a financial return on their investment more respectable than the starvation diet of less than 3% that has prevailed in the recent past. In these inflationary times, this rate of return can fluctuate rapidly up or down, but much will depend upon our wisdom in the selection of new capital investments—a decision in which many of you gentlemen will have an increasingly important role.

There are dark clouds

On the negative side of things, the

industry's future appears to have several black clouds hanging over it. First and foremost is the historic long term inability of the railroads to generate a level of earnings sufficient to support the necessary investment in new equipment—about which I will say more in a moment. We are all aware of the aggravated form that this has taken in the Northeast portion of the United States. However, the several significant receiverships in that region are merely extreme cases of the same malady that has afflicted other carriers in other regions. The American railroads form a giant unified network with many companies depending on interchange of cars with their connecting lines for 50% or more of their traffic. From a service point of view, it is a question of the chain being no stronger than its weakest link. Customers dependent on interline connections for handling their traffic are interested only in the total service collectively produced, and all it takes is the disability of one of the railway participants in that chain to lose valuable business for all of us. Resolution of the Northeast problem is probably the most complex transportation task ever assigned to anyone. Needless to say, most railways are contributing valuable talent and the time of experienced officers to help in the solution, particularly in the matter of plant rehabilitation studies and program development. Unfortunately, the resolution of the Northeastern problem is still on somewhat shaky ground, with challenges being made to the constitutionality of the legislation that will hopefully lead to a successful outcome. I think we can all agree that a restoration of the viability of the eastern railroad system is absolutely essential.

A second major problem—much closer to your hearts—lies in the fact that throughout the country there seems to be a growing problem of keeping the steel wheel on the steel rail. Derailments today are more costly and far more widely publicized because of the volatile nature of some of the lading involved. This is compounded by the growth of our cities, with highly populated commercial and residential properties bordering high-density rail lines and major freight yards. In all fairness to the track men, however, the most recent and spectacular accidents have been caused not by any track or wheel problem, but rather by improper handling and switching in train yards; by damage to our facilities perpetrated by outsiders; and by the inadequate containment or chemical instability of the shipments themselves.

Whatever the cause, we are developing an unfortunate image that has been aided and abetted by sensational coverage afforded by new media which did not exist very many years ago. Nevertheless there is encouragement even in this area because we are attacking these problems vigorously. The cooperative research that has been conducted for several years by the A.A.R. and various manufacturers and shippers to develop and improve tank car design is in advanced stages. So far as reducing derailments is concerned, we seem to have been afflicted to some degree simply by inadequately maintained track—a condition that is the kind of thing that we can really get our teeth into with improved earnings. But a far more distressing type of derailment has prevailed on even the most highly maintained railroads—the "spooky" derailment which gives cause for much deeper concern. Fortunately we are well along in our fundamental research with such programs as the California and Kansas projects mentioned earlier, and I am fully confident that we will solve our problems in the same manner that railroad men have always overcome their difficulties in the past.

The final two areas of concern on which I would like to spend the remainder of my time this morning involve, first, the growing trend for local, state and federal governments to establish so many standards, regulations, guidelines, reports, and programs that we are finding it difficult to make our free enterprise system work. And finally, we have the terrible impact of a rampant inflation, which produces its heaviest toll on industries such as ours which are both capital and labor intensive.

Government intrusion in business

Our problem with Government is not unique to railroads, but our history indicates that the railway industry could provide an early target for those who prefer Government ownership and centralized planning to the free market mechanism which has served our nation for almost 200 years. Strict government regulation of course is something we have lived with for a long time. As our railroad representative testified at the recent conference on inflation, we have been operating with the strictest of controls on the prices we charge to our customers, but without controls on the costs which our suppliers can charge us. I firmly believe that the continued government intrusion in our business—which in the extreme form could end with government ownership—is our most pressing long-range concern.

If there are any doubters among you that the various levels of government are becoming increasingly involved in business, I suggest the following exercise. Draw up a list of reports to governmental agencies that you and your employers must now file that were not required ten years ago (EEOC, OSHA, FRA, EPA, ICC, etc.). Then make a list of governmental reports, if you can find any, which have been eliminated in the last ten years; compare the 1965 budget and number of employees working for the various business-connected departments and regulatory agencies of the government with their budget and work force this year; visit Washington, D.C., and note the buildings recently completed and under construction to house expanding government activity—or, if you live in a city of any size, make a similar survey of new government buildings in your home town; or check the interview schedule in a college placement office to find out how many government agencies are out there competing with us for the recent graduate.

If, after all of this, you reach the conclusion there is a dramatic growth in the size of government and its impact on our day-to-day business and general economy, the next question might be "Why has this growth occurred?"

One reason, I suppose, is that there seems to be a natural tendency for organizations of all types—business, churches, schools, etc.—to expand. In most cases this drive toward expansion is held in check by economic forces. Business and other private institutions have budgets which are limited by the income they receive from the goods or services they produce. Government, on the other hand, with its power to tax and create money, has a far less direct restriction on its ability to expand. University of Chicago economist, Milton Friedman, views this public unconcern about government growth as a myopic failure to recognize the old adage that "there is no such thing as a free lunch."

In a speech before a group of businessmen here in Chicago last year, Professor Friedman warned that until business and other private institutions are willing to say "no" to proposed government programs that will benefit them, they can hardly complain about the expansion of government activities which hurt them. In other words, business cannot seek the use of federal money without expecting that the government might also exercise an active hand in running the borrower's business. Dr. Friedman ended his talk with the pessimistic conclusion that the trend toward broader government involvement in traditionally private areas of activity will be non-reversible if no one shows any willingness to say "no" to government proposals which appear to offer some temporary advantage. While one can agree with Professor Friedman up to a point, I am not willing to accept his pessimistic conclusion that the trend toward ever-expanding government activity is irreversible if we can get the public sufficiently concerned about it.

I think there are now some signs that a growing segment of our population might agree with Thomas Paine's statement that "Government, even in its best state, is but a necessary evil; in its worst state, an intolerable one." If that view of the proper role of government is to spread, those of us who are connected with private enterprise must take every opportunity to point out the real accomplishments of the free market and the shortcomings of centralized government control and planning.

For our part, however, we must, at the same time, see to it that we are actively solving as many social and economic problems as we can without assistance or prodding by the Government. We cannot ignore major segments of our population in our hiring and training practices and then profess surprise when the Government sets equal employment opportunity goals for us. We cannot provide inadequate transportation services for our customers and simultaneously complain about government interference—and we cannot fail to find ways to carry out our affairs in a manner that will assure our stockholders and private creditors an adequate return on their invested funds—unless we are willing to accept increased government investment and control.

The impact of inflation

Those may sound like brave words when we consider the last major obstacle that I mentioned—the impact of inflation and the disastrous effect that it has on capital formation. While this is a subject that has received top billing in the past several weeks, it is something that has been creeping up on us for a good many years. Just recently I had occasion to review some of the testimony entered in the Congressional hearings leading to the Transportation Act of 1958. At that time the very same concerns that are being expressed by the railway industry today were eloquently set forth—only the numbers have changed. In my conversations with railway officers other than those in finance, I find a startling unawareness of the financial facts of life that the managers of a capital and labor intensive business such as ours simply must understand. The same unawareness is displayed by many politicians and members of regulatory commissions, who seem to feel that a railway company is being treated fairly if it makes a few cents more than the direct cost of performing service—which, to many people, meets the description of compensatory freight rates.

In the recent Summit Conference, repeated reference was made to the necessity of all segments of our economy sharing the burden of inflation equally. Now, as a matter of ordinary equity, it is hard to argue with the theoretical argument that if wages are restrained, profits should also be held down. Unfortunately, those who hold this view—and that includes practically every man on the street that you will meet—have a mistaken concept of what profits are all about and just who it is that receives those profits. It is the prevailing feeling that the profits of a railway company all go directly into the coffers of a few rich barons on Wall Street—to the detriment of the employees and properties on which they work.

This is of course a myth that has to be corrected, and I would urge that you gentlemen act as spokesmen to that end. The fact of the matter is that a railroad's profits—the figure on the bottom line which remains *after* paying all regular expenses, including maintenance of track and equipment, plus state, local, and federal taxes—must be very gingerly treated. Few people understand that only a portion of the profits go to the owners and that vast quantities of capital must be ploughed back for the purchase of new cars, locomotives, freight yards, heavier rail, new signal systems, and other improvements needed to keep our service modern and competitive. Funds for the replacement of existing equipment—to say nothing of completely new types of facilities—come from three possible sources: (1) New equity financing—that is, the issuance of new capital stock—a process that has become non-existent for Railroads due to their low earnings potential; (2) the depreciation charges on old equipment, which is the annual portion of the initial cost of capital facilities that can be expensed each year to reflect the wearing out of that facility; and (3) retained profits of the company. Of course borrowing money is also a means of providing the cash on any given date, but this is just a temporary expedient. Even when borrowed funds are available at the 10% rates prevailing today, no prudent manager should borrow unless the forecasted earnings stream will cover both the interest and the repayment of the debt. In other words, no matter how favorable the terms, in the final analysis debt is only another way of using earnings—that is future earnings—to finance capital expansion.

What has happened to our industry and almost every other capital intensive business is that inflation has caused the price of all the products we buy to skyrocket in recent years. For example, a freight car which we are replacing today, and for which we were allowed to charge depreciation over its life, may have originally cost $6,000; to replace it at the beginning of 1974 probably would have required $18,000; it probably costs $25,000 today and may well be up to $27,000 or $28,000 by next year. The difference between the $6,000 accumulated against the cost of the original car and the cost of buying a new car must come from profits—and I would emphasize that those profits come *after* giving Uncle Sam his 50% share in taxes. Every projection that I have seen suggests that unless inflation is effectively stopped in the immediate future, there will be a capital crunch in this country which will bring many businesses to a grinding halt.

Profits provide new facilities

Although our employees and labor leaders welcome the purchase of new locomotives, cabooses, and rolling stock, and become excited about the prospect of new yard or line construction, they too often speak out against the source of these capital expenditures—namely, profits. In the same regard, politicians call for increased productivity, full employment and an end to shortages, but then they support legislation which increases the cost of doing business and lowers the profit margins which are the life blood of modernization and expansion. It is obvious that somehow we must do a better job of getting our story across; The message that we must give to our fellow employees, and, incidentally, to our labor leaders, is that unless corporate profits are permitted to reach a higher degree than has been currently enjoyed in the railroad business, we will be hard pressed to furnish the new facilities with which our employees will earn their living. This is a most serious message which I hope you will carry with you.

In summary, I would say that while it may sound like a big order to meet the often competing and conflicting demands of our employees, our customers and our investors, the railroad industry has done a pretty fair job in the past, or we wouldn't be alive and growing more than 100 years after our start. With all due respect to the DOT, the FRA, and the other federal and state bodies who are spending time and money to solve our problems, in the final analysis those problems will best be solved by men like you, working for private companies and through private institutions like your Associations, and using private funds generated from efficient and profitable transportation services.

If each of us in the railroad industry do our jobs properly and speak up for things we know are right, then our future should be every bit as good as the brightest days in our past.

President Autrey: Thank you, Mr. Reed. You have certainly given us food for thought and we are glad to hear you point out that there are several bright sides to the future of railroading. I think too many times we hear about the problems and the darker side and we are prepared to face those problems but it's good to hear the bright side pointed out so that as we solve our problems we know we are looking towards that brighter side.

We know you have a busy schedule and if you feel it necessary to leave, feel free to do so, but we would like to have you stay for as much of our program as you can.

Mr. Runde, the rostrum is yours.

President Runde: At this time I would like to present Mr. H. M. Williamson, chief engineer, system, Southern Pacific Transportation Company, who will display a movie showing us the construction and operation of the Southern Pacific's West Colton Yard. Mr. Williams.

Construction of West Colton Yard

By H. M. WILLIAMSON

Chief Engineer-System, Southern Pacific Transportation Co.

Thank you, Mr. Runde, and gentlemen, and I think I see one lady here. Yes.

It is a pleasure to be with you this morning. Mr. Reed, I certainly enjoyed your talk. It couldn't be more timely, I think, for this group, if they will take that message back with them. This is certainly the way we have to go to really make our industry viable and accomplish all the things we have to do to keep the steel wheel on the steel rail.

While we are waiting to get the camera or projector set up, and I was kind of sweating out its arrival this morning, because I wasn't prepared for 35 minutes of talking, I have a few observations about the retarder yards.

Apparently there is a resurgence in retarder yards. We have just completed ours. I will show you a movie of it. Our good friends on the Santa Fe are building one at Barstow. I had the pleasure of going up there and looking at it the other day. The grading

H. M. Williamson

is virtually all completed and they are laying rail now.

One aspect of retarder yard construction which really came into play just recently and never has before, we talk about all the electronic gadgets, and all that sort of thing, but we all have to become farmers now because I know the Santa Fe and I imagine Tom Hutchinson down at Waycross, Georgia, with his retarders, and certainly ours at Colton, we are planting African daisies and olive trees and rock gardens, all to conform to the requirements of the ecologists. We have a very big pollution problem, but these things are really becoming a thing of beauty. They are not the old, conventional railroad yard, as we grew up to know them, but they have taken a page from the Highway Departments' book and are planting all our slopes and everything with shrubbery and foliage. I think the Santa Fe yard in Barstow is going to be the garden spot of the west.

Your President, Bill Autrey, and I had the good fortune as being two of the representatives of the FRA to go to Russia about two months ago. We had a very, very interesting experience. We found their railroads to be, I would say, about comparable to ours, wouldn't you, Bill? They have a few low joints and we have a few high centers. Probably one of the biggest differences is their working force. Mr. Reed mentioned about the ladies they have employed on the Santa Fe. We have a few of them on the Southern Pacific and I presume every railroad does. But, boy, they really have them over there. That's women's lib for sure. About 30% of the people out on the track are women. And some of those gals out there were using those big sledges, and they were right out there spiking ties, helping lay rail, right with the men, so I guess they were a little ahead of us in that category.

Some of the other aspects we noticed was they were laying a lot of welded rail and concrete ties. They were putting in concrete ties principally because they don't have hardwoods in Russia, which was a big surprise to me. They claim they get only 12 to 15 years' life out of their softwood ties. So they are going to concrete now. Their welded rail was welded in lengths of 800 meters, which is about double the length of our stock.

They would lay the rail in panels and then they would come back afterwards and replace the panels by 800 meter stock.

We flew to Moscow. We were there for a day or two. We then took the Red Arrow, which is one of their crack passenger trains, a night train, from Moscow to Leningrad.

We arrived in Leningrad the next morning. It is a very beautiful city. We rode on some of their high-speed rail detection equipment and the challenger car out of Leningrad. We flew to Kiev, which is a very, very beautiful city. It was virtually devastated by the Germans during World War II. It has been rebuilt. It is very modern, and, as

I say, very beautiful. They have a lot of park areas in Russia and they spend a lot of their leisure time in the parks, looking at the exhibits and cultural things such as that. They do a lot of boating. They have picnics. They are great on culture. Now, for a moving picture we have on Russia.

(Movie)

I hope you enjoyed it. If you do have any questions, our time is short, but if you have any questions about it individually I'll be around here for the next couple of days and you can see me. If I can't answer them, I will find someone who can. Thank you. (Applause)

President Runde: Thank you, Mr. Williamson, for a most interesting and informative presentation.

This concludes the second and final joint session of the 1974 Joint Convention. The Roadmasters will reconvene in a few minutes in this room. The B. & B. Association will meet in a few minutes in the Adams Room on the sixth floor.

The Roadmasters will convene again in this room tomorrow morning at 8:30, and the B. & B. group will meet in the State Ballroom at 8:30, which is across the hall.

This session is now adjourned.

(Recess)

MORNING SEPARATE SESSION

Wednesday, October 2, 1974

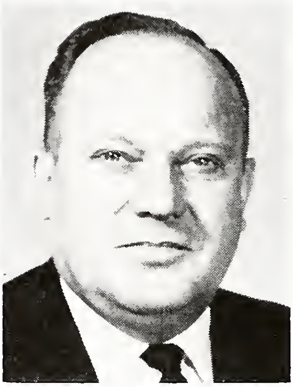
President Runde: It is a pleasure to call to order this 79th Annual Convention of the American Railway Bridge & Building Association. Those of you who are visitors and/or guests are especially welcome. The ladies also are most welcome.

At this time, as provided in the by-laws of our Association, it is my duty to present a report to you outlining the general conditions of our Association.

President's Address

By E. E. RUNDE

Monager Construction, Illinois Central Gulf



E. E. Runde

Our financial condition is good. We have a healthy bank account, most of it invested in interest-bearing securities. A detailed financial report will be given by our Treasurer at the business session on Thursday morning. We have been able to hold our yearly dues at the same figure of $7.00. We have no current plans to increase this in spite of the galloping inflation currently taking place.

Our good financial condition is due primarily to the sales of advertising in our Annual Proceedings. I am sure many of you have noted the increase in the number of advertisers in recent years. This is due to the professional sales efforts of an advertising agency with whom we have a three-year contract.

Our total membership is now approximately 700, which is about the same as in 1973, but considerably less than the peak membership of 968 in 1961. We are all aware, of course, of the decline in total number of railroad employees and have, in some degree, attributed our decline in membership to this. However, is this really true?

When I went to work for the former Illinois Central Railroad, we had 42,000 employees and the B&B Association had 594 members. Now, in 1974, the Illinois Central Gulf Railroad has less than 20,000 employees, but the B&B Association has 700 members. I am not suggesting that we lay off more track and bridgemen so that our supervisors will have fewer men to supervise and thus could join the B&B Association to spend their free time. I'm sure you will all agree that this would be negative thinking.

I do suggest, however, that these supervisors who now have fewer employees to supervise do, indeed, have more responsibility and thus must be more knowledgeable about their duties, and I don't know of a better way to acquire this knowledge than by membership in this Association and attendance at these meetings. Those of you who are in a position to do so are urged to acquaint your supervisors with the benefits of membership in the B&B Association and encourage them to apply for membership.

We believe we have a very interesting and informative program this year. This is due to the untiring efforts of your Board of Directors and a surprisingly few individual members. It is amazing that they are able to come up with such a diversity of information for your enjoyment considering the response they get to requests for information.

Each of you will receive in the mail in the very near future, a yellow card requesting your assistance in choosing topics for the next year's committee reports. You are urged to fill out this card and return it to our Secretary immediately. Only in this way will these reports represent the wishes of the majority of our Association members.

Your Executive Committee selects the subjects for Special Committee reports from those suggested by you, and at this time I would like to introduce to you the members of your current Executive Committee. I shall ask each member to stand as his name is called and it is requested that you withhold your applause until all have been introduced. Beginning at my extreme right, our three Junior Directors are:

Mr. W. E. Brakensiek, bridge engineer, Missouri Pacific Railway, St. Louis, Missouri. Bill is a member of our Public Relations and Convention Greetings Committees and of the Registration Desk Committee. He also is sponsor of the committee giving the report on Inner and Outer Guard Rails on Bridges to be presented later in the program this morning.

Mr. O. C. Denz, supervisor of building maintenance, Chicago, Milwaukee, St. Paul & Pacific Railway, Chicago, Illinois. O. C. is a member of the Ladies Entertainment Committee and of the Membership Committee, and is also sponsor of the committee giving the report on Protection to Bridges Over Navigable Streams to be presented later in the program this morning.

Mr. R. C. McMaster, engineer of facilities and structures, Bessemer & Lake Erie Railway, Greenville, Pennsylvania. R. C. is a member of the Necrology Committee and of the Resolutions Committee and is also sponsor of the committee report on Concrete Restoration to be presented in the program on Thursday morning.

Our intermediate group of directors includes:

Mr. J. W. Davidson, assistant director of bridge engineering, Burlington Northern Railway, St. Paul, Minnesota. Jim is Chairman of the very important Membership Committee and is a member of the Registration Desk Committee.

Mr. C. A. Hughes, assistant engineer of bridges, Southern Pacific Transportation Company, San Francisco, California, could not be present today. Cal is Chairman of the Necrology Committee and is a member of the Registration Desk Committee.

Mr. W. R. Hyma, bridge engineer, system, Atchison, Topeka & Santa Fe Railway, Chicago, Illinois. Walt is Chairman of the most important Ladies Entertainment Committee and is a member of the Advertising Committee.

Our senior directors are:

Mr. D. C. Gould, assistant structural engineer, Union Pacific Railway, Omaha, Nebraska. Don is Chairman of the all important Advertising Committee and is a member of the Ladies Entertainment Committee.

Mr. W. S. Stokely, construction engineer, Illinois Central Gulf Railroad, Chicago, Illinois. Bill is Chairman of the Registration Desk Committee and is sponsor of Standing Committee No. 1 on Materials.

Mr. W. C. Sturm, Senior Design Engineer, Elgin, Joliet and Eastern Railway, Joliet, Illinois. Wally is Chairman of the Public Relations and Convention Greetings Committee and is a member of the Resolutions Committee.

The officers serving during the past year are:

First Vice-President Mr. J. J. Ridgeway, director of engineering services, Bessemer & Lake Erie Railway, Greenville, Pa. John is chairman of our Special Subjects Committee and is a member of the Public Relations and Convention Greetings Committee.

Second Vice-President Mr. J. R. Williams, engineer of bridges, Chicago, Rock Island & Pacific Railway, Chicago, Illinois. Jack is a member of the Convention Program Committee and is sponsor of Standing Committee No. 2 —Equipment.

Third Vice-President Mr. W. H. Rankin, senior structural engineer, St. Louis, San Francisco Railway, Springfield, Missouri. Warren is a member of the Special Subjects Committee.

Mr. N. D. Bryant, bridge engineer, construction & maintenance, St. Louis-San Francisco Railway, Springfield, Missouri, is our immediate Past President. Daryl has continued to serve our organization during the past year by attending all of our quarterly Executive Committee meetings and giving us his guidance and counsel.

W. H. Huffmann, retired assistant vice president & chief engineer, Chicago & Northwestern Railway, Wilmette, Illinois. Heinie is our treasurer and also one of our esteemed past presidents.

Mrs. Ann Wilson, our Secretary, is unable to be here at this time because of her duties at the Registration Desk, but will be here for our business session on Thursday morning. I am sure that I speak for all of our Officers, Directors and Past Presidents in saying that we would be lost without our Secretary who handles all of the myriad details of the Association and provides the continuity needed for continuing our affairs year after year. You may now applaud this fine group. (Applause)

Thank you, gentlemen, you may now be seated. At this time we would like to give recognition to one of our Past Presidents who has continued to serve our Association, giving many extra hours of his time in doing so. I refer, of course, to Mr. W. F. Armstrong, engineer of buildings, C&NW RY, who was President in 1968-69. Bill is Chairman of the Hotel Arrangements Committee and is on the Publications Committee in which capacity he gets out the quarterly News Letters. He also is our representative on the Joint Associations Committee with representatives of the Roadmasters and Superintendents Associations. Bill, will you please stand and be recognized.

Award of appreciation

Also at this time we would like to give special recognition to two other gentlemen seated in the audience. Both of these gentlemen have served our Association in many capacities for many, many years and each is a Past President. Without their work our Annual Convention could not be the success that it always is.

I refer, of course, to Mr. M. H. Dick, vice president and editor of Railway Track & Structures and Mr. R. E. Dove, associate editor of Railway Track & Structures. Mr. Dick was President of our Association in 1958-1959 and has been Chairman of our Convention Program Committee for many years. It is through Mr. Dick's efforts that we have been able to obtain many of the special features and prominent speakers for our programs.

Mr. Dove was President of our Association in 1941-1942 and has been responsible for the publication of our Annual Proceedings for a number of years. He also headed the very important Hotel Arrangements Committee for many years.

Merwin and Bob, will you please step up to the rostrum so that I may present to you these certificates in recognition of your many years of devoted service to the affairs of the Bridge & Building Association.

Well, I'm sorry that Mr. Dick could not be present. But, here is the wall plaque and this is what it says: "American Railway Bridge & Building Association by this instrument recognizes and acknowledges its deep appreciation to Honorary Member, Merwin H. Dick, for his 37 years of devoted and distinguished service to this Association. Presented this 2nd day of October 1974 at Chicago, Ill., at the 79th Annual Convention of the Association."

Now, Bob. Here is one for you. It is inscribed the same way except that it bears your name and is for 40 years of faithful service.

Mr. Dove: Thank you, Erwin. It is a beautiful plaque. This is the first time in my memory that this has been done and I want you to know I fully appreciate this honor. It will be hung in a prominent place in my home. I thank all of you.

President Runde: Very good. Now, will you see that this other plaque is delivered to Mr. Dick?

It has been my privilege to serve as your President during the past year, and as a member of the Executive Committee for the preceding six years. I consider it an honor to have been selected for this duty, and the experience has given me great personal satisfaction. It is my intent to continue to serve the Association in any way that I can during the coming years.

Recognition of past presidents

The next item on the program is one that we look forward to each year —recognition of our past presidents who are here with us today. The introductions will be made by one of this select group. Will Mr. N. D. Bryant please step forward and present these esteemed gentlemen?

Mr. Bryant: I will present them in the order of their seniority. The oldest one present is Mr. R. E. Dove, who was president during 1941-42. Next in seniority is W. H. Huffman, who served in 1957-58. Then we come to Mr. M. H. Dick, who is not present this morning. He served in 1958-59. Next, is E. R. Schlaf who served in 1963-64. The next gentlemen is H. M. Wilson who served in 1965-66. This smiling gentlemen is R. D. Hellweg who served in 1966-67. Then next is J. W. DeValle who served in 1967-68. Next is W. F. Armstrong who served in 1968-69. Next is J. A. Goforth who served in 1969-70. Next is A. R. Dahlberg who served in 1970-71. Then we come to me, the youngest past president by the calendar. I served in 1972-73. Thank you.

President Runde: Thank you Daryl. We are glad these past presidents could be here this morning and be recognized.

We are now ready to present our Committee reports and special features. Those of you who have taken an active part in the preparation of these reports know that they are the result of much hard work on the part of the chairmen and committee members. Following the presentation of the report, you are invited to participate in discussion and to ask questions. If you wish to comment, please stand, state your name and affiliation and direct your question to the chairman.

At our previous conventions it was the practice of Railway Track & Structures to print a special convention issue, including a pre-printed insert of all Committee Reports. For reasons of economy, this was discontinued this year. However, our Association decided to pre-print some of the reports and copies of these are here at the rostrum for those of you who want them. If we run out of copies, please leave your name and address with me or with our Secretary and a copy will be mailed to you. All of the reports, of course, will be published in our Annual Proceedings which will be printed and distributed by mid 1975.

Our first report is that of Special Committee No. 1 on "Inner and Outer Guard Rails on Bridges." The sponsor is Mr. W. R. Brakensiek, bridge engineer, Missouri Pacific, who will introduce the committee.

Inner and Outer Guard Rails on Bridges

Report of Committee

COMMITTEE—J. R. IWINSKI, *Co-Chairman*, asst.ch.engr.struct., C.&N.W., Chicago; J. C. HOBBS, *Co-Chairman*, engr.trk., R.F.&P., Richmond, Va.; O. D. ANTHONY, asst.ch.engr.-br.&struc., B.&A., Houlton, Me.; J. BUDZILENI, asst.to br.engr., C.R.I.&P., Chicago; A. L. CHISHOLM, b.&b.supvr., S.P., Oakland, Calif.; R. K. CORBETT, gen.fore. b&b&ws, A.T.&S.F., San Bernardino, Calif.; J. W. DEVALLE, ch.engr.br., Sou., Atlanta, Ga.; T. L. FULLER, engr.br., S.P., San Francisco, Calif.; R. D. HELLWEG, reg.engr., Amtrak, Chicago; and J. L. MATHIEU, const.supvr., I.C.G., Chicago.

J. R. Iwinski

This report is concerned with the use of inner and outer guard rails on bridges and in describing, in general terms, various types presently in use and the methods used to fasten them to the bridge decks. Although, not originally a part of the report, some attention will be given to inner guard rail installations at locations where piers for overhead bridges or other structures are located close to the tracks.

The subject of inner guard rails is somewhat controversial with some roads swearing by them and others swearing at them. The "swearing by" group contends that during a derailment the guard rail will guide and retain a derailed truck within certain limits so that no damage or very little damage will be inflicted upon the adjacent structure, confining repairs to replacing the damaged ties. The "swearing at" group contends the guard rail will tend to cause the truck to deflect more to the side causing greater dislocation of the car and greater damage to the structure and deck than if no guard rail were there. In addition, certain track maintenance functions are hampered by the presence of guard rail, thus increasing costs.

Undoubtedly, the stand of both groups is correct to a certain degree. There are so many variables involved that it is almost impossible to say that the use of guard rails is all bad or all good.

To try to shed some light on the dilemma, your Committee canvassed a number of major roads to determine their current practice in relation to guardrail installation and to investigate the various types of materials and methods of fastening used. Previous research on the subject by the American Railway Engineering Association was, also, consulted and proved to be very helpful. A total of twelve different railroads across the entire country were contacted—and provided a substantial amount of data regarding their installations. Nine maintain inner guard rails of some sort while only one road's practice is to totally eliminate inner guard rails.

All of the roads that do maintain inner guard rails, generally, utilize the same materials, fastenings, etc., with minor variations to suit their own peculiar circumstances.

Following is a generalization of the data compiled from the sources mentioned.

Inner guard rails on bridges

Basically, the inner guard rail consists of two lines of rail generally of a quality no longer suitable for service in track. All joints are fully bolted and it is fastened directly to the tie with two spikes per tie per rail. There were only a few roads that used tie plates under the guard rail; however, no basis for their use was given. The weight of the guard rail can be any conveniently available size, provided it is lighter and, consequently, somewhat lower in height, but not more than 2 in. lower, than the running rail. A lessor used type of guard rail consists of a 5-in. by 8-in. treated timber and a 6-in. by 3½-in. by ½-in. steel angle placed side by side on the ties with long leg of the angle facing the running rail. The timber and the steel angle are both fastened to the tie with drive screws.

The inner guard rails are usually spaced from 8 in. to 13 in. from the gauge side of the running rail and extended past the end of the bridge about 50 or 60 ft., varied to accommodate local conditions, such as, street crossings, switches, etc. The ends are tapered toward the centerline of the track for the last 15 ft. to 20 ft. and are fitted with a scrap, usable frog point which is beveled from the base upward at about a 30-deg. to 60-deg. angle to reduce the possibility of catching dragging equipment. When frog points are not available, the ends of the rails are then cut and beveled in a similar manner or otherwise modified to eliminate any obvious obstruction. This type of treatment would apply to guard rails facing oncoming traffic. On double tracks, where there is no real possibility of traffic from the other direction on one track, most roads have elected to stub off the guard rail at the end of the bridge or at distances varying from 5 ft. to 15 ft. from the end of the bridge. A small porportion of roads use guard rail only on the bridge proper and do not extend it onto the embankment at all.

The type of bridges where guard rails are installed vary widely. Usually, all through-girder spans and through-truss spans have them as do most deck trusses and the long and high steel bridges. Long pile trestles, also, are included if they exceed a certain height, usually between 25 or 30 ft. In some cases, certain conditions, such as speed, curvature, heavily traveled highways passing under, etc., will dictate whether or not guard rail is warranted. The decision to install inner guard rail is, usually, reserved for the chief engineer either through Approved Standard Drawings or by an individual decision based upon special circumstances involving a bridge that does not meet criteria set forth in the Standards.

Where there are two tracks on a bridge, it is usually the railroad's option to use two lines of guard rail for each track or just one line located closest to the running rail located farthest from the supporting girder or truss. If there is a girder or truss located between tracks that extends above the rail, then each track is treated as a single track and two lines of guard rail are used per track.

Outer guard rails on bridges

Outer guard rails are really not guard rails in the same sense that inner guard rails are. Although, they do provide some protection against "bunching" caused by a derailed truck, their primary purpose is to act as a tie spacer, keeping the ties from moving under normal rail traffic. They are used only on open-deck bridges.

Almost without exception, outer guard rails consist of either a 4-in. by 8-in., 5-in. by 9-in., or 6-in. by 8-in. timber. On steel spans these timbers are fastened with bolts passing through about every third tie. Where conditions permit, these same bolts are also attached to supporting steel members using appropriate hardware. Between these bolt locations, the timbers are fastened to each tie with one of the large variety of lag screws, drive spikes, double-grip spikes, etc., that are available. The location of the outer guard rails in relation to the gauge side of the rail varies somewhat, dependent upon the type of steel support the ties rest on.

On timber spans, the fastenings are handled in the same manner, except where a timber stringer is located directly under the guard rail, the bolts, also, pass clear through the stringer.

Speed or curvature seems to have no bearing on use of outer guard rails.

Inside guard rail near adjacent structures

The responding roads were divided almost equally on the use of this type of inner guard rail. On the roads that did use them, they were usually placed on main lines only and only when a supporting pier was closer to the tracks than a certain specified distance, which varied anywhere from 10 ft. to 25 ft.

Speed and track curvature did have some influence on whether the guard rail was to be installed as did the design of the adjacent supporting pier. As before, the final decision on the use of inner guard rail at any location is reserved for the chief engineer. The materials, spacing, lengths, fastenings, etc., for this type of guard rail are almost identical to those described for inside guard rail on bridges.

The American Railway Engineering Association's research project for use of inner guard rails was conducted in 1958. It consisted of a questionnaire directed to a large number of Member Roads inquiring as to their practice of using inner guard rails on bridges or adjacent to structures. Also, whether the presence of the guards were effective in keeping the equipment upright during a derailment and preventing damage to the structure, or if in fact had the damage been more severe because of their presence.

Replies were received from 26 of the railroad systems then active in the United States and two from Canada. Eighty-two percent of the replies stated that the inner guard rails were effective in derailments, while only eight percent stated they were not. The remaining replies were; questionable effect 7% and no experience 3%. It is interesting that eight of the ten roads responding to our current survey, also, responded to the 1958 A.R.E.A. Survey with basically the same stand in regard to use of inner guard rails. The subject of outer guard rails on bridges was not covered in the A.R.E.A. project.

It appears from the above data, some of which was collected about 16 years ago and still appears valid today, that the use of inner guard rails on bridges and near adjacent structures does have some benefit.

A number of slides showing typical guard rail installations and Standard Plans will now be shown.

President Runde: Thank you, gentlemen for an interesting presentation of a controversial subject. You are now excused with the thanks of the Association.

Our next report is that of Special Committee No. 3 on "Protection to Bridges Over Navigable Streams." The sponsor is Mr. O. C. Denz, supervisor building maintenance, The Milwaukee Road, who will introduce the committee.

Protection of Bridges Over Navigable Streams

Report of Committee

COMMITTEE—M. NOYSZEWSKI, *Chairman*, br.engr., I.C.G., Chicago; F. B. LINDSAY, JR., *Vice Chairman*, gen.B&Bsupvr., Sou., Greensboro, N.C.; F. T. ALLEY, engr.br., S.P., Houston, Tex.; G. F. BOESER, supvr.br.mtce., C.M.S.P.&P., Chicago; G. D. DOHERTY, ch.carp., C.M.S.P.&P., Perry, Iowa; R. E. FRAME, dist. engr., S.P., San Francisco, Calif.; D. C. GOULD, sys.br.supvr., U.P., Omaha, Nebr.; W. W. HAINES, B&Bsupvr., U.P., Portland, Ore.; W. R. HYMA, br.engr. sys,. A.T.&S.F., Chicago; R. E. RED, B&B supvr., U.P., Hinkle, Ore.; E. E. RUNDE, mgr.const., I.C.G., Chicago; H E. SCHRAB, ch.carp., C.M.S.P.&P., Chicago; J. F. SCHMITZ, B&Bsupt., M.P., Little Rock, Ark.; and P. F. VIEHWEG, des., E.J.&E., Joliet, Ill.

M. Noyszewski

Following the fur traders and explorers, the early settlers used the rivers to gain access to the interior of the continent. By the 18th Century the rivers became the principal transportation and communication links moving the raw materials and agricultural products to the cities and manufactured goods to the frontier. The development of the keelboat in the early 19th Century resulted in extensive canal building in the east, and similarly the introduction of the steamboat on the Mississippi River System developed river transport to a level unequalled until modern times. It was noted that more tonnage was carried by this river fleet than by all the vessels of the British Empire.

During the Civil War most of the river fleet was burned, and with the expansion of the railroads, a demand no longer existed to move goods to the east coast via the Gulf ports.

The driving of the golden spike at Promontory Summit on May 10, 1869 highlighted an era of intensive railroad construction which followed the Civil War and extended into the early years of the 20th Century. To the railroad bridge builder, a more significant event occurred when the first train crossed the Eads Bridge over the Mississippi River at St. Louis in June 1874. With the successful completion of this structure, bridge builders confidently proceeded to span every river.

During this period of railroad expansion, inland water transportation nearly came to a halt. Beginning in 1866, Congress made appropriations for rivers and harbors. In 1878 a program was started for six-foot canalization of the Upper Ohio River by a system of movable dams and locks, and also a 4.5-ft. channel was begun on the Upper Mississippi, Illinois and Missouri rivers. These improvements shifted the emphasis in inland water transportation from packet boats to towboats pushing barges loaded with bulk commodities. In 1910, Congress authorized a nine-foot slack water channel for the entire length of the Ohio River.

During World War I, the federal government began to operate a barge service on the Illinois, Mississippi, Missouri and Warrior rivers, and in 1924 the wholly federally-owned "Inland Waterways Corporation" was formed. Perhaps it is strictly a coincidence, but the 35-year period of federal ownership coincides with the most spectacular development of waterway since the introduction of the steamboat. By 1953 the federal government had provided, at the taxpayers' expense, nearly 27,000 miles of waterway (9700 miles of which were 9 ft. or more in depth in 1953 and 16,000 miles in 1974).

Technologically, the industry exchanged stern-wheel steamboats able to push four or five barges, weather and waterway conditions permitting, for the modern diesel-powered, radar-equipped towboats capable of handling in excess of 50,000 tons in almost any weather.

This spectacular expansion can be readily seen here (slide). Rivers and canals accounted for only 1.4% of U. S. intercity freight in 1929 and jumped to 10.7% in 1973, with resultant increase in tonnage from 8.6 trillion to 237 trillion ton-miles.

It is our contention that without the multi-billion dollar federal investment, the barge traffic, as we know it today, could not have been possible. Thus, if the rivers had been left in their natural state, the railroads crossing navigable streams would not have been exposed to hazards from extremelarge and cumbersome tows.

Perhaps some day legislation will be passed to include navigation protection systems as a federal responsibility, just as locks, dredging, etc., are today. In the meanwhile we must allocate our scarce funds to the renewal and maintenance of protection systems.

To conserve time, the following portion of this report will be presented in an outline form. The items are self-explanatory and very little amplification will be provided.

Justifications for protection

(1) Legal (usually a requirement of bridge permit)
(2) Protection against boat strikes.
(3) Protection against drift and running ice
(4) Aid in free movement of vessels

Contributory causes of damage

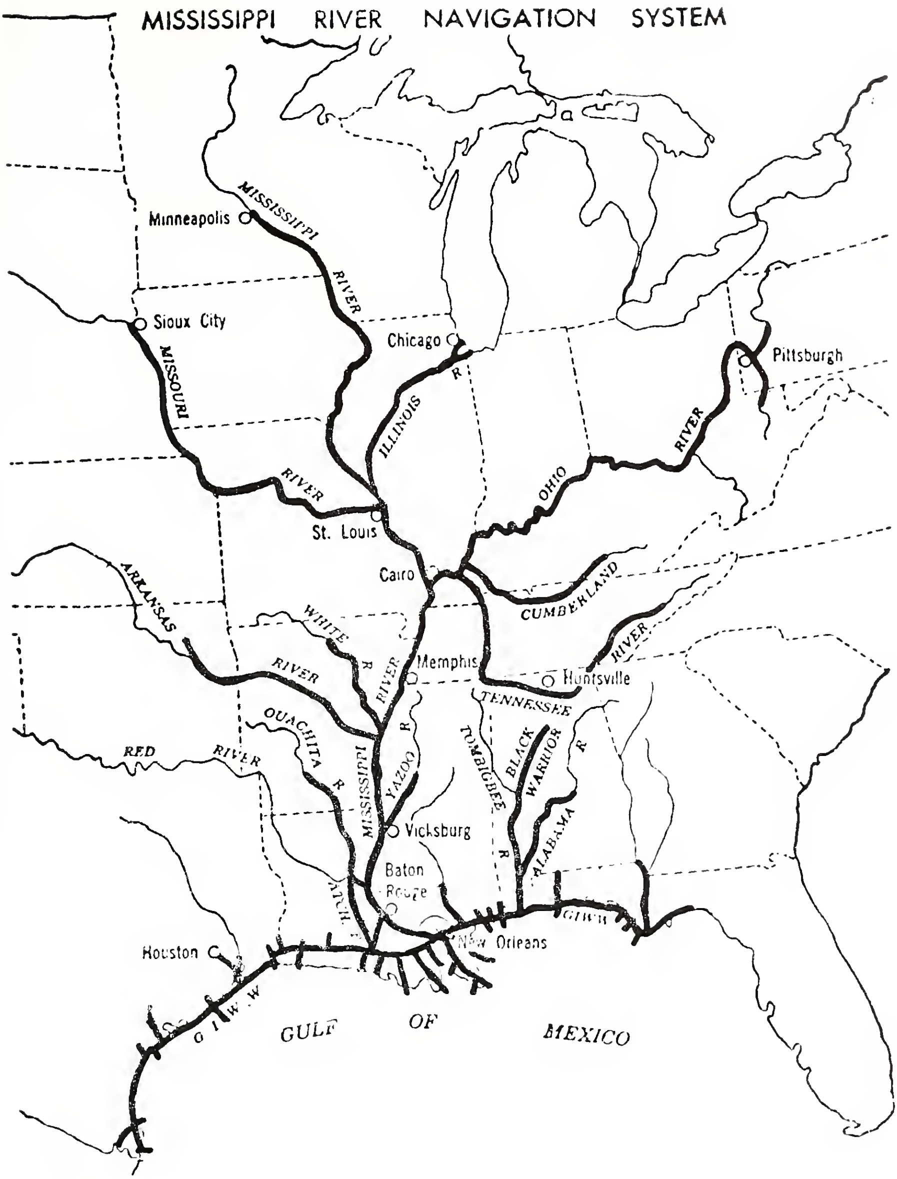
The problems that we are now experiencing with our protection systems can be readily attributed to one or more of the following:

(1) Obsolete design
The majority of our protection systems is designed for the small tows in service prior to extensive channel widening and lowering.

VOLUME OF U.S. INTERCITY FREIGHT

Millions of Freight Ton-Miles and Percentage of Total

Year	Rail-roadsa	%	Trucks	%	Great Lakes	%	Rivers and canals	%	Oil pipe-lines	%	Air	%	Total
1929	454,800	74.9	19,689	3.3	97,322	16.0	8,661	1.4	26,900	4.4	3	—	607,375
1939	338,850	62.4	52,821	9.7	76,312	14.0	19,937	3.7	55,602	10.2	12	—	543,534
1944	746,912	68.6	58,264	5.4	118,769	10.9	31,386	2.9	132,864	12.2	71	—	1,088,266
1950	596,940	56.2	172,860	16.3	11,687	10.5	51,657	4.9	129,175	12.1	318	—	1,062,637
1960	579,130	44.1	285,483	21.7	99,468	7.6	120,785	9.2	228,626	17.4	778	—	1,314,270
1972	784,300b	37.8	470,000	22.6	108,900	5.2	229,800	11.1	480,000	23.1	3,700	0.2	2,076,700
1973p	850,000b	38.7	510,000	23.0	114,000	5.1	237,000	10.7	495,000	22.3	4,200	0.2	2,220,200



(2) Insufficient power
Some towboats can barely handle large tows under normal operation conditions, and are virtually helpless in emergency situations
(3) Adverse weather or visibility
(4) Crew incompetence
(5) Excessive speed

Alternatives

(1) Longer spans
(2) Strengthening of piers to take a collision
(3) Reduction in size of tow
(4) Bow steering unit

(5) Improved supervision of tow operators

Protection systems

(1) Timber pile clusters
(2) Timber cribs
  a. Internally braced
  b. Waler covered
  c. Rock filled
  d. Grouted rock fill
(3) Steel cells
  a. Internally braced
  b. Sand filled
  c. Rock filled
  d. Grouted rock fill
  e. Concrete filled
(4) Extruded rubber impact absorbing fenders
(5) Pneumatic impact absorbing equipment
(6) Experimental systems

Methods of installation and maintenance

Economical procedures are possible only with the use of waterway equipment rarely owned by a railroad. Therefore, the usual practice is to perform such work by contract.

Damage claims

A comprehensive discussion of the many problems associated with the collection of damages is beyond the scope of this report. It would be well to stress, however, that some railroads have found that their collections significantly improved when they provided cameras to the bridgetenders. The need for immediate notification of the boat owners is well understood.

Additional protection considerations

In any discussion of bridge protection we should not overlook the arguments in favor of the installation of radio telephones on certain movable bridges. Frequently, because of adjacent bridges and bends in the river, pilots cannot clearly see the bridge until they are perhaps a half mile from it. With today's heavy and often underpowered tows, it is difficult to stop a tow a safe distance upstream from a closed bridge. Even a minor collision involving barges handling petroleum products can have disastrous results for all concerned. A bridge operator able to maintain constant communications with both rail and river traffic can advise pilots when they are still a considerable distance from a bridge, and thus improve the chances of a safe passage.

Navigation lights also afford considerable protection in defining the channel through the bridge and assisting the pilot in properly aligning his tow. Thus, it is advisable for the bridge owner to provide an effective lighting system.

In conclusion, there is evidence that locks and other construction are now being planned for depths in excess of existing legal channels which can trigger another cycle of major navigation improvements. This, in turn, will encourage larger tows capable of even more severe damage to our bridges. As it appears unlikely that protection systems can be devised to eliminate recurring damages, it is imperative that we press for legislation to include navigation protection systems as a Federal responsibility, just as locks, dredging, etc., are today.

President Runde: Thank you gentlemen, for a most interesting presentation. I am sure that all present will agree that the protection of our bridges over navigable streams is becoming a greater problem to railroad bridge owners each year. You are excused with the thanks of the Association.

Gentlemen, it is now my great pleasure to present as our next speaker, a man who has spent most of his career in the service of the United States Coast Guard, on the other side of the fence, so to speak, since he is charged with the responsibility of seeing that your bridges do not become an obstruction to navigation. At least this is true for those of you who have bridges over navigable streams in the Second Coast Guard District which encompasses all or portions of 19 Midwestern states. May I present Mr. S. W. Thoroughman, chief-bridge section, Second Coast Guard District, who will address us on "Bridges and Navigation Interests." Mr. Thoroughman.

Bridges and Navigation Interests

By S. W. THOROUGHMAN

Chief, Bridge Section, Second Coast Guard District, St. Louis, Mo.

Good morning. I appreciate this opportunity to talk to you about my day-to-day problems. I see several familiar faces which reminds me that I should say OUR day-to-day problems. I believe that the very fact that I've been invited to meet with you here today is indicative of *mutual* concern. And indicative, too, of a progressive outlook on the part of B & B Engineers, and railroad management; a recognition of the overall transportation problem and an earnest desire to make a contribution toward solving at least our little part of it.

Did you know that according to a 1972 tabulation there were 206,400 miles of railroad main-line right-of-way in the United States? Did you know that in the same year there were 25.-543 miles of commercially navigable waterways? No correlation, really. We don't really *care*, do we.

S. W. Thoroughman

But when I say that there are 663 miles of navigable channel between Minneapolis, Minnesota and the mouth of the Missouri River and that these 663 miles of river are spanned by 20 railroad drawbridges, I get your attention. And when I say that in 1972 there were over 60 million net tons of cargo transported over these 663 miles in barges carrying about 1500 tons each, usually lashed together to form a tow of fifteen barges or, a tow of about 25,000 tons, then I know that I will get the attention of any B & B man who is trying to maintain drawbridges between Minneapolis and St. Louis. Now we're beginning to get an understanding of what's going on. Now we recognize that our 20 drawbridges are really exposed to the possibility of some harsh treatment.

It doesn't take a genius to figure out that a drawbridge, constructed around the turn of the century to accommodate packet boats, is suddenly finding itself threatened by frequent, harsh and unexpected punishment. Its timber sheer fences didn't expect this; its floating sheer booms which were built to corral log rafts—not packet boats, mind you, but log rafts—through the draw span were certainly not built with these boats and barges in mind. But it's not just sheer fences and floating sheer booms. It's also expensive steel cells. It is 61-pile dolphins like the Chicago & North Western constructed at Clinton, Iowa only to have it destroyed before the sap quit running. Well . . . . we're not going to solve that problem today; at least I'm not but maybe I can help to identify it.

Barge tows growing larger

Towboats are getting bigger. More horsepower. They are pushing more barges, particularly where the waterway is not restricted by locks. Ten thousand horsepower boats are now going south out of Cairo pushing forty-two, even forty-eight barges. And coming back with the same size tows. There are several standard sizes of barges but a typical "jumbo" is 35 ft. wide by 195 ft. long. Forty-two barges going south out of Cairo would probably be made up seven wide and six long. Made of typical barges, then, this is 1170 ft. long by 245 ft. wide.

More boats and more barges are being built. Those of us who are concerned with bridges can look forward to an increase in the number of tows moving on the river. My personal observation tells me that lock dimensions, channel dimensions, radii of bends, and similar restrictions will effectively limit the size of tows on the canalized rivers. So, once again, what we can look forward to is an increase in the number of movements through bridges.

Trying to improve steerability

I do not see any significant improvement or change in the method of towing or in handling capability. Some of you know what I'm talking about when I mention a bow steering unit. This is a power unit, a small barge, if you will, equipped with a large outboard-type propulsion unit. It will turn 360 deg. and when located at the head of a string of barges, or elsewhere in the tow, greatly increases steering capability.

These units are controlled from the pilot house. They are effective. But they are not feasible for all tows. It is my understanding that the cost is prohibitive. So, even though bow units may seem to be the answer to a pilot's prayer they are apparently not a feasible solution to the problem. The trend is more toward improving the handling capability of the towboats by improving rudder design, rudder and engine control, and so forth.

All of you have steered some kind of boat, I'm sure. You know that you have to keep a boat moving through the water in order to steer it. Theoretically, at least, the faster the boat goes, the better it steers, up to a point, of course. Also, theoretically, a pilot approaching a drawbridge should pour the coal to it, for better control. But when you are talking about a tow of barges 105 ft. wide, for example—25,000 tons let's say—and a drawspan of, say, 120 ft. horizontal clearance then discretion had better override theory. On the other hand, when a tow approaches a drawspan at dead slow speed, the tow is subject to the whims of the current and wind. It's really a helpless feeling to stand in a pilot house and watch the head of your tow move sideways. So, since most large tows do approach slowly this, then, is the source of our trouble and this is what we are endeavoring to find a solution for.

Problem caused by delayed opening

Delays in opening account for much damage. A towboat pilot approaching a drawbridge, downbound, who suddenly finds that it isn't going to open by the time that he gets there, is faced with the need to start maneuvering which more often than not results in a less than desirable approach. He is faced with two choices when the span does open. He can continue a bad approach and hope for the best or he can stop and back up the river (which could take as much as a half hour) to get re-aligned in a proper position for running the span.

I'm convinced that marine radiotelephones on drawbridges has done much to reduce damages. A pilot can call a radiotelephone-equipped drawbridge from a considerable distance and, if necessary, slow down while a train clears the bridge so that the span can be open when he gets there. So . . . when you're talking about reducing damages at drawbridges, don't discount the operating capability of the drawspan or the adequacy of communications between boat and bridge.

Law requires safe passage

I would not debate, here or elsewhere, the age-old argument of responsibility for damages and the responsibility for providing for the passage of vessels through a bridge. To me the law is clear. We administer the laws pertaining to bridges, in our District, with the understanding that the owner of a bridge—the Permittee—is responsible for providing for the safe, prompt, and efficient passage of vessels through the draw. This is clearly set forth. While we appreciate the bridge owner's primary concern for the safety of his structure we must recognize—and often call attention to—his obligation to provide for the passage of navigation.

Look at it this way: A railroad owns right-of-way up to one bank of the river and right-of-way up to the opposite bank of the river. The space in between is a public thoroughfare. It can be occupied only with the permission of the government representing the public. So, in order for the railroad to occupy or cross this thoroughfare, a federal permit must be obtained. In order to obtain such a Permit, the applicant—or Permittee—must agree to several things, principal of which is that never during the lifetime of this bridge will he permit it to unreasonably interfere with navigation.

So, this is what we are really talking about. We sometimes think that this entire subject is merely one of economics with engineering considerations as prime factors. Unfortunately, perhaps, this is not the case. It is a matter of fundamental law that navigation of a stream is *not* a matter of economics but of public right.

Funding of protection cells

Before concluding these remarks I would like to comment on two often-asked questions. First: Are protection cells and similar structures not aids-to-navigation which should be maintained by the federal government?

We believe that protection cells, and similar structures at bridges are "appurtenances" and their maintenance the responsibility of the Permittee. They are not aids to navigation by definition. The bridge is their reason for being. Once again: "The owner shall provide for the . . . passage of vessels through the draw."

Secondly, Is there any provision for the federal government to participate in the funding of the maintenance or replacement of protection cells, or the construction of original cells?

As far as I know, the federal government has no such provision for participating in the funding of the construction or replacement of such structures EXCEPT under the provisions of the Truman-Hobbs Act. The Truman-Hobbs Act provides for federal participation in the funding of the alteration of bridges over the navigable waters of the United States found to be unreasonably obstructive to navigation. Conceivably, this could apply to the construction of a cell as well as to the alteration of an entire bridge.

I've brought with me a number of slides of boats, barges, and bridges. I've saved for last a series of shots that I took several years ago while passing through the old Burlington Railroad bridge over the Illinois river at Beardstown. I believe you'll find them interesting. I've also included a series of shots of the demolition of a span across the Ohio river at Cincinnati. I'd like to go ahead and show them now and if we have any time left I'll be available for answering questions.

(Slides are shown)

President Runde: Mr. Thoroughman, we want to express our special thanks to you for taking the time to appear at our Convention and apprise us of some of the special problems of the navigation interests.

This concludes the program for today. We will convene tomorrow morning at 8:30 in the State Ballroom on the fourth floor.

Those of you who have not yet registered, may do so here or at the Amphitheatre. Remember, however, you can obtain tickets for tonight's banquet and show only at the registration desk at the Amphitheatre.

This session is adjourned.

MORNING SESSION

Thursday, October 3, 1974

President Runde: The meeting will please come to order. The second and final meeting of our 79th Annual Convention is now in session. The registration at this time is 560 Roadmaster members, 230 associate members and 989 guests, making a total of 1,779. For the B&B the registration is 156 members, 33 associates and 192 guests, making a total of 381, and a grand total for the meeting of 2,160. There were 190 ladies registered.

These figures compare with 2,126 members and 228 ladies present in 1969, the last time REMSA had an exhibit during our convention.

If the Officers and Directors will now please come forward we will begin our Business Session.

BUSINESS SESSION

The reports you will now hear will provide you with information concerning the business affairs of your Association. If you have any questions concerning a specific report, we will be pleased to give you an answer. However, you are requested to withhold your questions until all reports have been given.

At our first meeting yesterday, our Secretary, Mrs. Ann Wilson, was not able to be present because of her duties at the Registration desk. However, she is with us this morning and will now present her report.

Secretary's Report

Report of Membership as of September 25, 1974

ACTIVE MEMBERSHIP			
Total Active Members, September 10, 1973		459	
New Active Members since September 10, 1973		42	
Reinstated—Paid back dues		2	
		503	
LESS: Resigned account retirement, etc.	10		
Transferred to Associate	3		
Transferred to Life	9		
Reported deceased	3		
Dropped for non-payment of dues	26	51	
TOTAL ACTIVE MEMBERS			452
ASSOCIATE MEMBERS:			
Total Associate Members, September 10, 1973		73	
Transferred from Active		3	
New Associate Members since September 10, 1973		10	
		86	
LESS: Resigned a/c retirement, etc.	1		
Transferred to Life	2		
Dropped for non-payment of dues	6	9	
TOTAL ASSOCIATE MEMBERS			77
LIFE MEMBERS:			
Total Life Members—September 10, 1973		141	
Transferred from Active Membership		9	
Transferred from Associate		2	
		152	
LESS: Reported deceased	5		
Dropped for mail returned	2	7	
TOTAL LIFE MEMBERS			145
HONORARY MEMBERS:			
Total Honorary Members September 10, 1973		10	
Reported deceased		1	
TOTAL HONORARY MEMBERS			9
TOTAL MEMBERSHIP ALL CLASSES—September 25, 1974			683

President Runde: Thank you, Mrs. Wilson.

Mr. Huffman, will you please present the Treasurer's Report?

Treasurer's Report

Period September 1, 1973 to August 31, 1974

Checking Account balance August 31, 1973		$ 7,349.08
RECEIPTS:		
Dues	$ 2,421.00	
1972 Advertising	3,116.29	
1973 Advertising	7,603.44	
1973 Proceedings	7.00	13,147.73
		$ 20,496.81
DISBURSEMENTS:		
Salaries (Secretary & Assistant)	3,141.60	
FICA (On payroll)	183.80	
Office Rent, Telephone, etc.	512.03	
Stationery & printing	440.12	
Postage	579.12	
Office supplies	78.21	
1972 Advertising (The American Publishing Co.)	2,828.50	
1973 Convention Expenses	166.92	
State of Illinois Unemployment Tax	49.33	
IRS—Federal Unemployment Tax	10.23	
1972 Proceedings	2,853.79	
1973 Advertising	1,418.72	
Membership Certificates	144.48	
Executive Board Meetings	298.29	
Miscellaneous	109.38	
1973 Proceedings	3,733.66	
Transfer of Funds to H/F Svgs. & Loan Assn.	2,000.00	$ 18,548.18
Checking Account Balance August 31, 1974		$ 1,948.63
Homewood Federal S/L Assn. (5¼%)		2,885.38
Homewood Federal S/L Assn. (6½% – 8/31/75)		5,282.08
Homewood Federal S/L Assn. (6½% – 3/1/75)		2,044.53
		$ 12,160.62

President Runde: Thank you, Mr. Huffman.

Mr. Schlaf is chairman of the Auditing Committee and he will now present that report.

Report of Auditing Committee

TO MEMBERS OF THE AMERICAN
RAILWAY BRIDGE & BUILDING ASSOCIATION

Gentlemen:

The undersigned have examined the books of the Secretary and report of the Treasurer for the period from September 1, 1973 to August 31, 1974 inclusive, and have found them to be correct as of the latter date.

Respectfully submitted,
E. R. SCHLAF, Chairman
H. F. Lucas
H. M. Wilson

President Runde: You have heard the reports of the Association's Secretary, Treasurer and Auditing Committee. Is there any discussion? If not, I will accept a motion that the reports be approved as given.

(Motion is made and seconded)

The motion has been made and seconded that the reports of the Association's Secretary, Treasurer and Auditing Committee be accepted. All in favor say "Aye." All opposed say "Nay." The motion is carried.

Mr. McMaster is chairman of the Resolutions Committee and will he please give this report?

Report of Resolutions Committee

Mr. President, at the close of this 79th Annual Convention of the American Railway Bridge and Building Association, the Resolutions Committee offers the following resolutions:

BE IT HEREBY RESOLVED that the thanks of the Association be extended to Dr. Kenneth Hildebrand for his message of spiritual assurance.

BE IT FURTHER RESOLVED that the thanks of the Association be expressed to the prominent speakers who gave of their time and so capably shared their wisdom and counsel with us, especially AREA President, Mr. R. F. Bush, Mr. Alan Boyd, president of Illinois Central Gulf, Mr. E. R. English, regional engineer, Federal Railroad Administration, Mr. L. A. Durham, Jr., chief engineer, Norfolk & Western, Mr. J. S. Reed, chairman and chief executive officer, Santa Fe Industries, Mr. H. M. Williamson, chief engineer-system, Southern Pacific Transportation Company, S. W. Thoroughman, chief-bridge section, Second Coast Guard Division, Mr. R. E. Beck, chief engineer, Elgin, Joliet & Eastern, Mr. J. K. Aust, project engineer, Burlington Northern.

BE IT FURTHER RESOLVED that our thanks be expressed to Mrs. E. E. Runde and Mrs. W. S. Autrey and their committees, for their efforts in arranging registration and entertainment for our wives, and to the untiring efforts of the ladies who assisted in registration.

AND, BE IT FINALLY RESOLVED that the Association express its thanks to its Chairmen and their committees for their fine work in preparing the reports which were presented at the convention, also to Simmons-Boardman Publishing Corporation and its representatives for their capable assistance, to the Chicago, Rock Island and Pacific Railroad, Illinois Central Gulf, Railroad, Atchison, Topeka and Santa Fe, Chicago, Milwaukee, St. Paul and Pacific Railroad and the Chicago and North Western Transportation Company who provided assistance at the registration desk, to the management and staff of the Palmer House for their attentive cooperation and warm hospitality, as well as to the members of our executive committee and to our President, Mr. E. E. Runde, who has spent so much of his own personal time and effort in guiding the affairs of our Association over the past year.

Mr. President, we recommend these resolutions be made a part of the official record of this association, and that copies be presented to all concerned parties.

Respectfully submitted,
R. C. McMaster, Chairman

President Runde: Thank you, Mr. McMasters.

Mr. Hughes is chairman of the Necrology Committee but he is unable to be with us this morning. Mr. McMasters is also a member of that Committee and I will ask him to present this report.

Report of Necrology Committee

1973 - 1974

To the President and Members of the
AMERICAN RAILWAY BRIDGE & BUILDING ASSOCIATION:

It is with grief and regret that we report the known loss of nine (9) members through death during the past year. It is possible that other members have passed away during the year of whom we have no information. If you know of any, please report their names to the Secretary. The following have been reported since our last Annual Meeting in September 1973.

ACTIVE MEMBERS	TITLE — LOCATION	JOINED	DECEASED
W. E. Dowling	System Bridge Engineer Union Pacific R.R. Omaha, Nebr.	1967	1973
T. W. Landers	Office Engineer Quebec, North Shore & Labrador Ry. Sept Iles, Que., Canada	1961	1974
T. R. Pate	Bridge & Building Superintendent Texas & Pacific Ry. Fort Worth, Texas	1965	1974
HONORARY MEMBERS			
T. H. Strate	Division Engineer Chicago, Milwaukee, St. Paul & Pacific San Ysidro, Ca.	1918	1974
LIFE MEMBERS			
D. L. Babcock	Bridge & Building Supervisor Chicago & North Western Trans. Co. Milwaukee, Wis.	1953	1974
L. M. Frost	Bridge & Building Supervisor Grand Trunk Western Ry. Co. Mercer Island, Wash.	1938	1974
E. A. Mann	Vice President Modern Supply Co. Chicago, Ill.	1951	1974
D. C. Todd	Assistant Engineer Pennsylvania R.R. Newark, Del.	1942	1974
J. E. Yewell	Chief Engineer Bessemer & Lake Erie R.R. Greenville, Pa.	1941	1974

Respectfully submitted,
C. H. Hughes, Chairman

President Runde: Thank you, Mr. McMasters.

Each year three new Directors are elected to serve our Association, and each year, after three years of devoted service, three Directors leave the Board. In rcognition of the many hours of their personal time given to carrying out the work of our Association, we wish now to present certification of this recognition to our three retiring Directors. Will Messrs. Gould, Sturm and Stokely please come forward.

Don, Wally and Bill—Words cannot adequately express the appreciation of the Association for the many hours of your personal time you have devoted to Association affairs during your terms as Director. This certificate will, in no way, compensate for this, but it will serve to say to you that all of the 711 plus members of the Association appreciate the service you have given. Thank you all.

During the past several months, our Nominating Committee, which is comprised of our five most recent Past Presidents, has selected a slate of candidates to serve as Officers and Directors of our Association for the coming year. Mr. Daryl Bryant is chairman of this committee and I would like him to come forward now and present the list of candidates chosen by his Committee.

Report of Nominating Committee

Mr. Bryant: For the three new Directors we nominate F. B. Lindsay, Jr., general bridge supervisor for the Southern at Greensboro, N.C.; M. Noyszewski, bridge engineer, Illinois Central Gulf, Chicago; and Jim Payne, division engineer, St.L.-S.F. at Memphis, Tenn.

For Secretary, we nominate Mrs. Ann Wilson, 18154 Harwood Avenue, Homewood, Ill.

For Treasurer we nominate W. H. Huffman, retired assistant vice president and chief engineer, North Western, Chicago.

For third vice president we nominate J. C. Hobbs, assistant chief engineer, Richmond, Fredericksburg & Potomac, of Richmond, Va.

For second vice president we nominate the advancement of W. H. Rankin, senior structural designer, Frisco, Springfield, Mo.

For first vice president we nominate J. R. Williams, engineer bridges, Rock Island, Chicago.

For president we nominate J. J. Ridgeway, director engineering services, Bessemer & Lake Erie, Greenville, Pa.

President Runde: Thank you, Daryl. Additional candidates may be nominated from the floor. The election will be held immediately following the program this morning.

Is there any new business to be brought to the attention of the membership? If not, the business session is adjourned and the Officers and Directors are excused.

The next item on the program is the report of the Standing Committee No. 1 of which W. C. Sturm is chairman. He will introduce the subject and the speaker.

(Slides on Roofing Inspection and Maintenance were presented and narrated by Richard Milbauer, Tremco Corp.)

Roof Maintenance

By R. W. MILBAUER

Sales Representative, The Tremco Manufacturing Co.

This report covers some basic facts, condition and problems concerning roofs, both old and new. The question of the old roofs, many of which have had a minimal maintenance problem, and new roofs, of which many have had a high frequency of maintenance problems, has puzzled division superintendents, division engineers and B. & B. supervisors for many years. Today's new roof looks the same as the old in that they are both black or they both have gravel covering them. This is where, generally speaking, the similarity ends. An old 5-ply roof was a complete build-up of 5 plies of 15 lb. felt and bitumen between each ply. The old roof or true 5-ply roof has about 250 to 300 pounds of felts and bitumen per square (100 sq. ft.).

The new roof or 5-ply rated roof has many combinations which give the roof its rating. (Example: one base 45 lb. felt and two or three 15 lb. felts). Today's 5-ply rated roof has about 90 to 140 pounds of felts and bitumen per square. This means with today's 5-ply rated roof there is approximately a 53% to 64% shortage or difference in material weight for application. Skimpy applications and strip moppings of bitumen will increase the percentage of difference, reduce the waterproofing properties and possibly introduce separation (delamination) of the felts. The felts of today differ from the felts of old in that they are now paper as opposed to the old rag felt. Demand for felts has caused the felts to be saturated in many cases by a dipping process, which can trap moisture, rather than forcing the bitumen through the paper. These few facts will help answer the question of old versus new roofs.

This does not mean, however, that all problems in new roofs are caused by material or application. It is a combination of conditions, that can lead to problems. New constructions tend to be lightweight and much more expensive. The co-efficients of expansion and contraction in the new lightweight steel, aluminum and glass buildings is vastly different from that of the old concrete, brick block and steel building. The roof-mat system used to protect the new type building is therefore put under great stress due to the different rates of expansion and contraction of these different materials. The 5-ply rated roof-mats have 53% - 64% less waterproofing material, so therefore the mechanics of aging (the ultra-violet rays of the sun, thermo and mechanical movement) are accelerated and strict maintenance procedures are needed sooner.

Three inspection methods

The time when maintenance is needed can only be determined by an orderly periodic inspection of the roof-mat system. There are three basic methods used when inspecting roof-mat systems:

The first is *visual*. This means walking the roof area checking all possible areas, where conditions lead to problems. Areas to check are coping stones, coping stone joints, flashings and patterns of blisters. Blisters are trapped moisture, and, if there is a pattern to them, they sometimes can lead to the source of the problem, for example, a hole in the flashing. All conditions should be noted, so that during the mechanical and chemical inspection these areas can be further checked.

The second method used is *mechanical.* One part of this method is coring the roof-mat near blistered areas if there are any. The core should be approximately four inches square. This will allow you to determine if moisture is present in the insulation or roof-mat system. This core will also show whether the felts still have good lamination. Patching the core should be done four inches beyond all cuts with a sandwich application of the proper based mastic and jute.

The flashings and metal edge systems should be closely scrutinized at the lap joints and batten plates. Brush the loose gravel away from these areas, if the roof-mat has gravel. Gravel can hide many small conditions, which can lead to serious problems.

The third method is *chemical.* This is used to determine what type of bitumen was used during the original installation. Armed with the results of the three types of inspections you will be able to determine what conditions exist, but now you have to use the proper system to control them.

There are many materials on the market today and it is important when selecting the product that you know if it will complement the present roof-mat. Coal tar pitch is a by-product of coal and asphalt is a by-product of oil and the two are not chemically compatible. A coal tar pitch roof-mat requires tar based products and an asphalt roof-mat requires asphalt based materials.

There are four basic types of materials:

(1) Mastics
(2) Emulsions
(3) Cutbacks
(4) Elastomerics

Some examples of usage of these products are:

(1) The proper based mastic can be used for patching or flashing work.

(2) Emulsion can be used for the coating of smooth asphalt roofs and the vertical sections of flashings. Caution should be used when installing and storing emulsions for they will wash off if rained on before set and will freeze if stored in a frigid area.

(3) The proper based cutback can be used for major roof restoration on gravel roofs. Material should not be used or heated without technical assistance.

(4) Elastomerics: there are many products with this name. Their compatibility with dissimilar materials is somewhat in doubt. Technical data and help should be used in this area.

Flashings often instigate problems

There is one part of your roof-mat system that has been mentioned quite frequently in this presentation and that is "flashings." 70% to 80% of all problems in roof-mat systems can be traced back to a condition that originated at the flashings. The inspection schedule on all flashings should be at least once a year. This is one of the most important steps that can be taken in a Preventive Roof Maintenance Program. Water infiltration at the flashings will go in one of three directions:

(1) Into the roof-mat system accelerating the mechanics of aging and causing blisters.

(2) Into the building and this is where hidden costs can really accelerate the cost of roof maintenance.

(3) Into the walls where damage can occur if the building is in a cold climate (freeze-thaw cycle).

Water may not just follow one of these problem routes but two or three of them, so Preventative Roof Maintenance becomes a very obvious and beneficial option.

Preventative Maintenance will also help extend the life of your roof-mat system. There are many factors which affect the life of your roof-mat system. The basic ones are:

(1) Thermo-movement (shock)
(2) Mechanical movement (cranes)
(3) Elements (Ultra-violet rays, wind, etc.)
(4) Blisters

Hours could be spent dwelling on each of the preceding points but the first three points generally are somewhat understood by most of the division superintendents, division engineers and B. & B. supervisors. The fourth one is less familiar, and yet very prevalent on most roofs. Blisters are caused by moisture or vapor trapped in the roof-mat system. As the sun warms the roof-mat to temperatures as high as 160°F the moisture will expand 1500% and this will put 600 P.S.I. against the roof-mat causing a blister. These blisters are relatively simple to control but again check for the source of the problem in your orderly inspections.

I realize that this presentation is very general and I hope that this will serve as an introduction to a projected information report coming for Committee #6 A.R.E.A. in late Fall or Spring.

President Runde: Thank you, Wally, and our special thanks to you, Mr. Milbauer.

Next we will have the report of Special Committee No. 2 on "Concrete Restoration." Mr. King.

Concrete Restoration

Report of Committee

COMMITTEE—B. J. KING, *Chairman*, br.engr., A.T.&S.F. Coast Lines, Los Angeles, Calif.; R. J. BECKER, *Vice Chairman*, v.p.MidwestReg., Lee Turzillo Contracting Co., Omaha, Nebr.; H. E. ANDERSON, mgr.oper., Osmose Co., Madison, Wis.; E. R. BLEWITT, v.p., The Penetryn System, Willoughby, Ohio; J. W. CHAMBERS, br.const.engr., M.P., St. Louis, Mo.; R. C. MCMASTER, engr.facil.& struc., B. & L. E., Greenville, Pa.; and A. B. WANG, b&b supvr.(ret.), L.&N., Lafayette, Ind.

Concrete restoration is a problematical subject to engineers and maintenance men world 'round. Due to the universal availability and remarkable versatility of concrete, it is used for nearly every imaginable building purpose and in practically all earthly environments. Like all materials, concrete will succumb in some degree to the exposure to time and to the elements and will deteriorate. The effects of this deterioration will, at some point in time, require some type of repair to increase the concrete's life expectancy. The tremendous continuing increase in the utilization of concrete as a building product and its inevitable deteriorating process has, consequently, magnified the importance of today's subject and it shall become increasingly important in years to come.

The purpose of this report is to explore the methods of concrete restoration in use in America and to stimulate some fresh thinking founded on the knowledge of these existing repair techniques. In all probability, there are repairs of concrete structures about to be undertaken, and on some structures the repairs have been delayed due to costs, traffic interruption or unsureness of the best procedure. Perhaps this report will give a better idea of the most practical method for solution of the restoration problem. Perhaps in the near future articles or committee reports on new innovations in restoration methods and materials will begin to be seen. Perhaps the railroad industry will begin to attack its enormous problem of deteriorating concrete with a new boldness. If these things happen, the purpose of the work of this committee will have been fulfilled.

Concrete deterioration is defined as any adverse change of normal mechanical, physical and chemical properties either on the surface or in the whole body of concrete, generally through separation of its components. Assuming good workmanship in the manner of mixing, placing and curing of concrete, there are relatively few factors which cause its deterioration. The more common factors are: Temperature, in the form of freeze-thaw cycles, expansion and contraction or temperature gradient between the surface and inner concrete; reactive aggregate, internal expansion resulting ultimately from a chemical reaction of chemically unstable aggregate; sulfate attack, attack on Portland cement by water and soils with a high concentration of sulfates; other chemical reaction, such as internal expansion due to the inclusion of excessive amounts of free lime or free magnesia in the cement; shrinkage cracks caused by drying and carbonation; leaching, soluble constituents of concrete dissolved and removed by solvents that percolate through it; structural design, insufficient strength or shape characteristic allowing deterioration from external mechanical forces such as excessive live loads, foundation movements and seismic forces.

It is important to note that, excepting structural design and expansion or contraction, moisture is basic to most deteriorative processes. In order to properly determine the method and amount of repairs that should be done at a particular location, some analysis of the type, extent and cause of the deterioration must be made. The deterioration could be merely a texture defect such as: Bleeding channels, sand streaks or pockets, water pockets, stratification, honeycomb, segregation, discoloration or efflorescence. None of these usually require repairs for structural integrity. However, some are indicative of inherent weakness and may be a location of future distress.

Cracking, a more serious phenomena than the texture defect, is more apt to require restoration. For a better basis of common nomenclature and mutual understanding, refer to the American Concrete Institute's Committee 201 report, "Guide For Making a Condition Survey of Concrete in Service." Committee 201 states that a crack should be classified by direction, width and depth. The following adjectives can be used: longitudinal, transverse, vertical, diagonal and random. Three width ranges are suggested; fine—generally less than 1 millimeter; medium—between 1 and 2 millimeters; and wide—over 2 millimeters. Four general categories of cracking are:

(1) Pattern cracks—Fine openings on the concrete surface in the form of a pattern, resulting from a decrease in volume of the material near the surface, or increase of material below the surface, or both.

(2) Checking—Development of shallow cracks at closely spaced but irregular intervals on the surface of the concrete.

(3) Hairline cracking—Small cracks of random pattern in an exposed concrete surface.

CRACKS, after cleaning, can be repaired by injecting grout into them.

(4) D-cracking—The progressive formation of a series of fine cracks at rather close intervals, often of random patterns, but in slaps paralleling edges, joints and usually curving across slab corners.

A.C.I. Committee 201 also defined the terms used to describe concrete deterioration, however, since they are fairly self-explanatory only time to mention them will be taken. They are: disintegration, distortion, efflorescence, exudation, incrustation, pitting popout, erosion, scaling, peeling, spall, dummy area, dusting and corrosion.

Almost all of these conditions can be precluded by the use of good design and stringent inspection of the concrete materials and of the workmanship.

Once the evaluation of type, extent and probable causal factor of the cracking or deterioration is made, a method of repair must be chosen. There are several methods available by which adequate repairs to the concrete can be made and from them the one best suited for the particular problems of traffic interruption, repair time and cost for the specific job can be chosen.

Remove-and-replace technique

One of the oldest methods of repair and perhaps the most used, at least until recent years, is the remove-and-replace technique of restoration. In cases of heavy structural failure, deterioration or damage, the remove-and-replace method is still probably the prime restoration procedure.

Falsework is generally necessary to help support the structure while the removal and replacement work is underway. The falsework can also serve as, or help support, necessary staging to work from.

After the falsework is in place and the structure secured, the deteriorated or damaged concrete may be removed. Jackhammers or pavement breakers of various sizes are common tools for removal on the larger areas, reducing to pneumatic bush hammers, chipping guns and hand chipping for smaller areas. Explosive charges are not unknown in concrete removal but their use is usually limited to the larger and not the average job. The remaining concrete surface must be clean and sound, ready for the new concrete to bond to it. Reinforcing steel should be clean to produce good bond also, and if the member or area needs additional structural strength, more reinforcing bars may be added by tying to the existing reinforcing or by drilling and doweling into sound concrete.

Forms are placed next and they are usually bolted onto anchors set into the remaining sound concrete. Forming for lighter, smaller areas may be fastened in place by nailing to nailing strips that have been shot on by the cartridge type nailing gun. Forms must be strong and tight and have windows or other provisions to facilitate ease and adequate placing of the concrete. Good forms also insure a finished product with the desired grades and lines and a pleasing appearance.

Mix design should be considered carefully. High early strength cement is sometimes desirable with the cement content high enough to insure a good strength factor but not so rich that it might promote cracking. Strengths up to 4,000 psi can usually be attained with a cement mix of six sacks or less, often five sacks are sufficient. A low water-cement ratio is always desirable. An air-entraining admixture for better workability is helpful in placing the concrete and keeping the water content low. It will also help prevent cracking during the life of the concrete.

Concrete pumps have made difficult casting jobs relatively easy and can ease the work of producing quality concrete. A mix as dry as that which can be chuted or placed by bucket may not be practical to pump, but with good design a fairly dry mix, with all the qualities that may be required, can be achieved. If accessibility and the geometry of the restoration will allow placing the concrete by chute or bucket it may be more economical. In any case, care must be exercised in placing the concrete and the use of a vibrator, the correct size for the work, is mandatory in acquiring a dense concrete in all the recesses within the forms.

Curing the repair concrete should be started as soon as possible, after the surface has received its final troweling, to avoid surface cracking. A choice of pigmented curing compounds, wet sand or burlap, polyethylene film or paper should be made to best suit the curing needs. Three days in the forms is the usual practice. However, with the use of high early strength cement, test cylinder breaks can indicate strengths which will allow form removal the day following the pour. The new concrete should not be loaded until test cylinder breaks indicate sufficient strength gains to safely carry expected loads.

While not precisely a restoration method insofar as original lines and grades are concerned, deterioration as described above is often repaired by completely encasing the member with reinforced concrete. The encasement restrains the concrete from further disintegration and provides protection from the elements. This simple procedure has afforded economical longevity for many structures. However, it must be recognized that there is a danger, if the encased concrete is so weakened, that it could cause an instantaneous failure without previous warning.

Preplaced aggregates

Another restoration technique is the use of preplaced aggregate concrete. This method is commonly used on larger areas of extreme surface deterioration.

The surface must be prepared by the removal of all disintegrated and deteriorated concrete. Removal of approximately four inches or more to sound material is required for efficient use of preplaced aggregate concrete. The existing reinforcing steel should be cleaned or replaced, care being taken that the reinforcing steel and any embedded items are not displaced from their original locations. Additional reinforcing, if called for, can be placed at this time.

Forms of wood, steel or other approved nonabsorptive material are placed true to line and grade. They must be mortar-tight and sufficiently rigid to prevent objectionable deformation under load. Chamfers, mouldings and false joints should be used as required in the forms to provide a neat and uniform appearance of the finished surface. Forms should be coated with non-staining mineral oil shortly before the aggregate is placed. Surplus oil on the forms and any oil on the reinforcing steel, or other surfaces requiring bond with the concrete, must be removed.

Hard, clean, well-graded coarse aggregate is handled and deposited in the forms in such a manner that the grading of the aggregate in place will be as uniform as practicable. The aggregate may be lightly vibrated, tamped or rodded during placing operations to reduce the voids. Approximately twenty seven cubic feet of coarse aggregate is contained in each yard of preplaced aggregate concrete insuring the ability to obtain a dense, high strength, quality concrete.

Mortar of Portland cement, sand, water and admixtures so proportioned and mixed to produce a grout capable of maintaining the solids in suspension and which may be pumped without difficulty is necessary to penetrate and fill completely the voids in the preplaced aggregate mass. The admixture eliminates setting shrinkage, produces the effect of air-entraining agents and contributes to higher later-age strength. The tight packed coarse aggregate reduces drying shrinkage mechanically.

The mortar is placed by pumping which is done slowly, progressing from the bottom up to permit the mortar to completely fill all voids in the coarse aggregate, displacing air and/or water from the spaces between the aggregate particles. If the forms are completely enclosed, vents must be provided at the top of the forms so all excess air and water can be expelled. When appropriate, the forms are lightly vibrated to help remove air bubbles which sometimes adhere to the inside of the forms. This also insures a continuous film of mortar between the aggregate and the forms. The injected mortar will penetrate the rough texture and surface of the existing concrete which aids in insuring a bonded surface between the new and old concrete.

The quality of the mortar is not affected by underwater placement. This is a great asset since it precludes the necessity to de-water forms before placing the mortar, and it enhances the use of the preplaced aggregate process in underwater restoration projects in both fresh and salt waters. Extensive use of this method in underwater repair by contractors specializing in this service has established the excellence of the technique below water as well as above.

Curing preplaced aggregate concrete is the same as for any good quality concrete. The application of approved curing compounds or continuous wetting are the usual procedures used. The cured concrete has normal compressive strengths that range from 2,500 to 7,000 pounds per square inch.

Dry-pack method

Smaller areas of surface deterioration, which do not require repairs to the extent of that of the preplaced aggregate, often are restored by the use of the dry-pack technique. Dry packing is the placement of a stiff mortar usually by ramming or tamping, the amount of tamping varying with the size and shape of the hole to be patched. It is an exceptional job, in both new construction and maintenance, that does not require some dry-pack patching.

The patch area must be thoroughly cleaned of deteriorated material and any foreign material or laitence on the surface. A rough surface profile is desirable to effect good mechanical bond. When possible, the patch area should be outlined with a saw cut at least one-half inch deep and a few inches back from the edge of the deteriorated or damaged area. This assures that the edges of the patch will be in sound concrete and preclude the undesirable edge featherings of the patch. The surface should be kept continuously wet as long as possible before patching. Just prior to placing the patch mix, the old concrete should be dampened but left still slightly absorptive.

The design of the mortar mix for the dry pack should be varied to fit the particular requirements of the repair, but in general, the mortar should be of the same material and proportions as the base concrete when possible. The principal design requirements are: High early strength, low-drying shrinkage, good bondability and lasting durability. Admixtures such as air-entrainment are often used to help acquire these qualities.

Mix ratio designs are varied to suit the patch. For thin patches a common ratio is two and one-half to three parts coarse sand to one part cement, whereas one and one-half parts coarse aggregate to one and one-half parts fine aggregate to one part cement is typical for deeper patches. Water must be kept minimal using only that required for hydration and mixing. Approximately four gallons per bag of cement will give the desired consistency which will make the mortar cake in the hand when squeezed and leave a slight film of moisture in the palm.

Before placing the dry pack, the damp surface of the concrete should be scrubbed with a neat cement grout. This wets the surface uniformly, displaces air films and incorporates any loose material still on the old surface, improving bonding in general. The grout should be placed just before the mortar placement so that it does not dry out. This means that the mortar should be placed within ten minutes after the neat cement grout has been applied. Epoxy-based bonding adhesives are becoming increasingly popular for use in lieu of grout. They are somewhat easier to apply, the timing is not nearly so critical and the bonding strength at the surface between the new and the old concrete is greater.

Due to the rapid setting of dry pack and the low initial water content, curing is especially critical and must be started immediately after finishing so that enough water will be retained for hydration of the cement. Curing compound or moist curing is suitable for this type of work under normal conditions. The patch should be kept constantly moist for a week to ten days to assure full development of strength and preclude shrinkage which could cause it to break away from the repaired surface.

Latex-modified mortar has gained wide acceptance for resurfacing repairs because it has good adhesive properties combined with high compressive and tensile strengths. It is also flexible, resistant to alkalis and dilute acids, has low water-absorption properties and high bonding strength. Latex-modified mortar has a rapid setup time and must be finished and cured immediately after placing. It is not compatible with air-entrainment and usually has a very high slump. The high slump makes it quite fluid and relatively easy to place. However, it also removes it from the dry-pack classification.

Pneumatically applied mortar

Large and irregular areas of relatively shallow deterioration on a concrete structure can be successfully and economically restored by utilizing the pneumatically applied mortar method of concrete restoration commonly called shotcrete. The shotcrete method has been utilized for many years and most engineers are familiar with the general procedures involved. However, strict attention must be given to the quality of workmanship as it is of prime importance in achieving an effective, lasting repair.

Specialized equipment is necessary for pneumatically applying mortar and there is a variety of this equipment available on the market. There are some "wet-mix" machines designed and available; however, they are in the minority and this report will be restricted to "dry-mix" machines and the original shotcrete method.

There are two basic concepts in gunning equipment. The double pressure chamber, which functions as an air lock, delivers the dry mixed materials to an outlet valve where compressed air carries it through the hose to the nozzle. The compressed air stream machine is not a pressurized vessel, it is designed to entrain the dry materials into a compressed airstream which carries the material into the hose and to the nozzle. Water is injected at the nozzle resulting in hydrating coincident with deposit in both basic concepts. Refinements and variations of these basic concepts are available through several manufacturers. Other equipment that is not special but is required includes: Air compressor, concrete mixer, hopper box with vibrating screen, material hose, water pump, chipping hammers, air hose, nozzlemen communication equipment, scaffolding and assorted fittings and small tools.

Pneumatically applied mortar, like all concrete repair work, requires proper removal of all deterioration to sound material if the filling is to be permanent and the integrity of the structure restored. A minimum depth of one and one-half inches and boundaries chipped at a forty-five degree angle to a depth of not less than one inch gives the best results. Thin or feathered edges in the finished grade should be avoided. An excellent bond is achieved with properly applied shotcrete and square cut or undercut boundaries are not necessary. In fact, square or undercut edges should be avoided to prevent trapping the rebound material and creating sand pockets. Particular care should be employed when reinforcing bars are encountered in the chipping operation. Excessive hammer contact with the bars will tend to loosen and fracture the concrete in adjoining sound areas. This creates new paths for moisture penetration and eventual deterioration. Appropriate steps should be taken to chip out defective construction joints and cracks and to correct the existing condition by the installation of tie rods, dowels, cement grout intrusion or, where necessary for structural integrity, epoxy grout injection.

All expansion joints and moving separations must be maintained by the installation of pre-molded joint material or other appropriate means. Considerable judgement, however, must be exercised in the proper treatment for correction of working cracks and joints.

As soon as practical following the chipping preparation, the cleaned surfaces should be sealed by the application of a bonding seal which consists of one part cement to two parts of fine sand and thirty pounds of a metallic waterproofing per sack of cement used. This material is mixed to a slurry consistency and brush or pneumatically applied. It is important that the sealer be applied to a thoroughly cleaned and dampened surface. Air or water blasting just prior to the bond seal is preferable. Care must be exercised not to apply the sealer in excess, but all surfaces should be covered. The bond seal must cure for a minimum of twenty-four hours to permit oxidation and effect the heal. The purpose of the bond seal is two-fold: First, the seal will prevent air slacking of the chipped surface and, secondly, it will not permit the chipped concrete surface to absorb water from the applied shotcrete and cause a weakened bond between the old and new materials.

Shotcrete reinforcing

Generally, all shotcrete should be reinforced. Exceptions do occur where it is not necessary, however it is best to avoid omission when possible. Flash or thin coats of shotcrete should be applied with caution and only on clean sandblasted surfaces which show no evidence of water seepage. Epoxy bonding compounds have improved the probability of success of the thin, unreinforced shotcrete applications, still they should be restricted to special situations.

Standard reinforcement used in the shotcrete restoration technique is 2″ x 2″ x #12 x #12 or 3″ x 3″ x #10 x #10 galvanized welded wire fabric. With patch depths greater than four inches, an additional layer of mesh is installed for each four inches of depth. The mesh must be securely anchored to the original surface by grouted dowels or anchor bolts which are sized and spaced according to the depth of the shotcrete patch. Additional bar reinforcement is sometimes required with depths over four inches when appreciable areas are affected. Excessive reinforcing and reinforcing bars larger than #6 should be avoided, as bar concentrations increase the possibility of sand or rebound entrapment. Additional reinforcement at critical locations where distress is evident or the existing design is inadequate for changing conditions should be considered.

The dry-mix design of most shotcrete is a volume proportion of one part cement to three and one-half to four parts concrete sand aggregate, well graded and passing a one-half inch screen. Rebound is a factor in all pneumatically applied mortar and is consequently considered in the dry mix proportions. Actually, the in-place proportions should be approximately one part cement to three parts sand aggregate. Too rich a mix will result in excessive fine shrinkage cracks. Too lean a mix will produce considerable rebound waste and consequently a disposal problem. When using the large aggregate, which is up to three-quarter inch in size, the mix is generally the same one to three and one-half or four by volume proportions.

Quick-set acceleration additives have been utilized to an advantage in the shotcrete mix for special situations. An accelerating admix is very useful where general seepage cannot be controlled and is used extensively in the large aggregate unreinforced shotcrete applications, especially in rock tunneling operations. The use of calcium chloride needs extreme caution and is discouraged. Accelerating admixes are not generally required in concrete restoration techniques. The versatility of shotcrete permits variation of mix and additives as the situation dictates and should be utilized within the bounds of good practices.

The proper placement of pneumatically applied mortar depends largely upon the skill of the nozzle and gun operators. The nozzle operator is of prime importance to the integrity and quality of the shotcrete and should be thoroughly trained.

Nozzle velocities should be uniform, with pressure at the machine not less than 35 psi with a horizontal hose length of 100 ft. Increased pressures are necessary to maintain this nozzle velocity with increased hose length or vertical lifts. Water pressure at the nozzle must be maintained at not less than 10 psi greater than the air pressure at the machine. This will insure proper hydration of the material at the nozzle. If any application is made over a preceding coat, any deposits of loose sand must be removed and the prior layer must cure for more than two hours before application of the second coat.

Aesthetically acceptable restoration projects should have shooting strips installed at all corners and a piano wire stretched as a guide line over the area. High areas can be screened, but working the material must be kept to a minimum. All surface finishing must be done immediately after the initial set of the shotcrete. The thin surface flash coating should not be worked in any way.

After the desired surface finish has been achieved and the initial set has taken place, curing should begin. The surface must be kept moist for a minimum of 72 hours. Unfortunately, wet curing is not practical on many structural repair projects. In these instances an application of an approved membrane curing compound is acceptable.

Structural crack restoration

The repair techniques discussed thus far, with the exception of the remove-and-replace method, have application basically to surface deterioration and not to deep structural crack systems. Grout intrusion is sometimes used for structural crack restoration.

Special equipment necessary for grout intrusion, other than hand and pneumatic tools common to concrete restoration is a small mixer which is usually equipped with two tanks, one which can be charged while pumping from the second. The tanks are continually agitated to keep the slurry uniform and the solids in suspension.

The concrete surface requires no preparation, except for the removal of any grease or foreign material from the crack face which would deter bond of the crack seal. The cracks themselves must be thoroughly flushed to allow penetration of the grout slurry. Most of the crack area can be cleaned by flushing with water and blowing with high pressure air. In the more difficult cases other innovations may be used such as pumping water under pressure through grouting ports after partial seal of the cracks. A weak muriatic acid solution is often employed to open more stubborn cracks, however, it must be thoroughly flushed with potable water before grouting.

Reinforcing the deteriorated concrete is important because the cement grout usually will not develop enough bonding strength across the crack to restore the concrete to its original design. Reinforcing can be accomplished in several ways. The most common is probably by drilling holes across the crack, inserting steel reinforcing bars and grouting them in. Steel rods passing completely through the member and then tensioned by tightening the nuts on the ends are sometimes utilized. Cables similarly installed and other innovations have been used satisfactorily.

The surface of the cracks are sealed with a cement dry pack. High early-strength and non-shrink additives are used or a commercial premixed mortar can be utilized and is most convenient. Pumping ports must be left in the seal or drilled in afterwards. The type of port or pumping stem used depends on your equipment. A rubber grommeted injection nozzle is common and it precludes the need for any device in the pumping port that is drilled into the crack.

Design of the cement grout mix is of prime significance and must be carefully considered. Many of the same qualities that are needed in the grout mortar pumped into preplaced-aggregate concrete are necessary. Admixtures, together with the Portland cement, must produce a grout slurry capable of maintaining the solids in suspension during pumping, minimize shrinkage and develop good bond and compressive strengths.

The slurry is pumped from the mixing tank through the ports into the crack system. Pumping is started at the lower extremities and progressed upwards to take advantage of the gravity head to pressure the grout into the hairline cracks. Progression of the grout can be followed visually by the wetting of the crack seal. When the grout reaches the next higher port the pumping nozzle is moved up to that port and the lower one is plugged.

Since the grout slurry is completely contained within the crack system, no curing procedure is required. Good compressive strengths in the range of two to five thousand pounds per square inch can be easily achieved.

Epoxy-injection method

One of the most recent methods of restoring concrete deteriorating from both large structural and smaller surface crack systems is the epoxy injection method. This application of epoxy started in the early 1950's and due to its performance capabilities it has quickly grown to be widely accepted as one of the leading repair methods.

The normal array of hand and pneumatic tools used are supplemented by special equipment such as the epoxy pump, which is capable of metering the epoxy resin and catalyst and delivering them to the special mixing nozzle under a variable pressure. A concrete coring machine which can extract cores of several sizes is basic equipment and the availability of tensile testing of the concrete cores is needed.

The concrete area or member designated for repair is externally cleaned with compressed air, water, solvent or a combination of these as conditions warrant. Structural cracks to be repaired are examined and cores are taken for determination of crack depth, direction and magnitude, and also to find the amount and type of foreign material within the cracks. Analyzation of the condition of the parent concrete is made from the core. If the concrete is found to be sound, except for the existing cracks, the repair process is continued. If the concrete is judged too poor or too costly to repair by the epoxy injection method, other methods can be recommended from the information learned from the core.

If debris is found in the cracks that may not permit penetration or bonding by the epoxy, the voids are flushed with air, water, solvent or a combination of these. Cleaning is accomplished in the more difficult cases by drilling holes into the center of the concrete member to intersect with the internal voids, and then flushed from the inside out. If cleaning solution has been used, the voids are then flushed with fresh water and compressed air.

Once cleaning is accomplished, the cracks are again analyzed through the core holes and drilled holes. If a crack has progressed in magnitude to the point that it impairs the structural integrity of the bridge member, the crack can be pinned with reinforcing steel to assist the epoxy bond. These reinforcing pins are epoxied into drilled holes staggered along alternate sides of the crack and slanted inward to cross the crack, much like the pinning described earlier. The number and location of these pins is determined by the conditions at each particular crack.

Injection ports of four-inch lengths of three-eights inch pipe are commonly used and are placed at intervals along the crack. The spacing of the pumping ports is determined by the penetration of the epoxy that is desired. In pumping the regular viscosity epoxy, it is a rule of thumb that the epoxy penetration will be approximately the same depth as the distance to the next higher pumping port when the epoxy reaches the higher port and starts running out. The ports also serve the purpose of allowing air to escape as the voids are filled.

Cracks are sealed with alternate materials depending upon their width. A large crack one-half inch wide or larger can be effectively sealed with quick-setting high-strength cement mortar. Cracks of less than one-half inch width can economically be sealed with epoxy paste. Smaller cracks with widths of one-hundredth of an inch or less can be sealed with low viscosity epoxy. Cracks of widths smaller than this can most economically be sealed with polyester. For most effective sealing, the cracks should be lightly sand blasted and the sealer allowed to cure.

Epoxy-resin adhesive have many inherent advantages as a concrete crack restoration material. It is one of the best adhesives for bonding a wide range of adherends, both in specific and mechanical adhesion. They adhere well to most metals, plastics, wood, glass, concrete, ceramics, etc. The internal strength of epoxies to resist cohesive failure is very good and will often surpass that of thin-gauge metal, plastics, glass, concrete and wood. The epoxies cure without releasing moisture or other by-products since they are 100 percent solids. This reduces the possibility of entrapped gases, voids and porosity in the bond line, and makes a very low shrinkage factor. Most epoxy adhesives are not sensitive to variations in curing temperature and pressures. When cured, epoxy maintains its shape under prolonged stress and adverse environments longer than most adhesives due to its low-creep factor. It is insensitive to moisture and resistant to solvents, weak acid and alkali compounds. Epoxy-resin adhesives have the disadvantage of being costly and, if large

Viscosity — Low
Pot Life — 10 — 24 min.
Solids — 100%
Type Cured System — Solid
Gel Time (1/8″ film @ 70° F) — 45 — 55 min.
Compressive Strength — 16,800 psi —
Tensile Strength — 9,800 psi

Mixing Ratio:

Resin —2
Catalyst —1

volumes are involved, they may become economically unfeasible.

Epoxy-resin formulation may be varied to achieve particular characteristics to best fit special conditions, however, a typical set of characteristics would be as shown on previous page.

To inject the epoxy material into the cracks, a specially designed pump delivers the resin and catalyst in the appropriate ratio and under pressure to the mixing head. At that point the two parts are thoroughly mixed and enter the crack through the injection port. The pressure built up within the voids in the concrete varies from zero to one hundred pounds per square inch, depending upon a combination of the epoxy formulation, ambient temperature, width and depth of cracks and the volume of the void.

Injection is begun at the lowest point and progressed upward. When a port is filled to refusal, the pressure is held at a high level for a few seconds to insure complete filling of the void and then the port is plugged and injection moved up to the next higher port. As the process moves upward, air in the void is driven out through the upper ports. The injection pressure and epoxy viscosity causes even the smallest crack in the continuous crack system to be filled.

The curing time of the epoxy depends upon the formulation, volume of epoxy and ambient temperature. A typical material is injected into a crack system will be spread over a very large area in the small hairline cracks. This large area and correspondingly small volume of epoxy will require 10 to 12 hours to set up and 72 hours to gain its strength at seventy degrees temperature. It is possible that movement of the concrete being bonded, before the epoxy has cured, will adversely affect the bond of the adhesive. If relative movement is suspected, pinning, underpinning, prestressing, banding or some method of reducing the movement should be employed.

After injection and cure, cores can be taken at selected locations to confirm penetration, filling, bond and compressive strengths. Cores are tested to confirm epoxy formulations and the application procedures are achieving a bond strength that will return the structure to the design strength of the parent concrete.

It is not the intent of this report to try to delineate specific detailed procedures of the different methods that have been proven and that are in use today. It is the techniques that are available that have been presented in general terms, only explicit enough to indicate a method best suited for a particular restoration project. It is the intent to say to the railroad industry that there are good methods available to restore the crumbling concrete, so let's get on with the work.

President Runde: At this time, as your outgoing president, I would like to once again thank each member, Director and Officer, for the support you have given me during the past year and I ask that you support my successor in like manner.

Mr. Bryant, will you please step forward and conduct the election and installation of the new slate of Officers and Directors.

(Officers and Directors are elected and installed)

HISTORICAL INFORMATION

List of Annual Conventions

No.	Place of Meeting	Date	Membership
1	St. Louis, Mo.	Sept. 25, 1891	60
2	Cincinnati, Ohio	Oct. 18-19, 1892	112
3	Philadelphia, Pa.	Oct. 17-19, 1893	128
4	Kansas City, Mo.	Oct. 16-18, 1894	115
5	New Orleans, La.	Oct. 15-16, 1895	122
6	Chicago, Ill.	Oct. 20-22, 1896	140
7	Denver, Colo.	Oct. 19-21, 1897	127
8	Richmond, Va.	Oct. 18-19, 1898	148
9	Detroit, Mich.	Oct. 17-19, 1899	148
10	St. Louis, Mo.	Oct. 16-18, 1900	143
11	Atlanta, Ga.	Oct. 15-17, 1901	171
12	Minneapolis, Minn.	Oct. 21-23, 1902	195
13	Quebec, Canada	Oct. 20-22, 1903	223
14	Chicago, Ill.	Oct. 18-20, 1904	293
15	Pittsburgh, Pa.	Oct. 17-19, 1905	313
16	Boston, Mass	Oct. 16-18, 1906	340
17	Milwaukee, Wis.	Oct. 15-17, 1907	341
18	Washington, D. C.	Oct. 20-22, 1908	368
19	Jacksonville, Fla.	Oct. 19-21, 1909	393
20	Denver, Colo.	Oct. 18-20, 1910	428
21	St. Louis, Mo.	Oct. 17-19, 1911	499
22	Baltimore, Md.	Oct. 15-17, 1912	524
23	Montreal, Quebec	Oct. 21-23, 1913	570
24	Los Angeles, Cal.	Oct. 20-22, 1914	586
25	Detroit, Mich.	Oct. 19-21, 1915	665
26	New Orleans. La.	Oct. 17-19, 1916	710
27	Chicago, Ill.	Oct. 16-18, 1917	704
28	Chicago, Ill.	Oct. 15-17, 1918	716
29	Cleveland, Ohio	Oct. 21-23, 1919	776
30	Atlanta, Ga.	Oct. 26-28, 1920	840
31	New York, N. Y.	Oct. 18-20, 1921	850
32	Cincinnati, Ohio	Oct. 17-19, 1922	865
33	Seattle, Wash.	Oct. 16-18, 1923	846
34	Kansas City, Mo.	Oct. 21-23, 1924	837
35	Buffalo, N. Y.	Oct. 20-22, 1925	759
36	Richmond, Va.	Oct. 12-14, 1926	750
37	Minneapolis, Minn.	Oct. 18-20, 1927	754
38	Boston, Mass.	Oct. 23-25, 1928	755
39	New Orleans, La.	Oct. 15-17, 1929	755
40	Louisville, Ky.	Oct. 21-23, 1930	713
41	Chicago, Ill.	Oct. 16-18, 1934	592
42	Chicago, Ill.	Oct. 15-17, 1935	547
43	Chicago, Ill.	Oct. 20-22, 1936	588
44	Chicago, Ill.	Oct. 19-21, 1937	566
45	Chicago, Ill.	Oct. 18-20, 1938	589
46	Chicago, Ill.	Oct. 17-19, 1939	546
47	Chicago, Ill.	Oct. 15-17, 1940	610
48	Chicago, Ill.	Oct. 14-16, 1941	594
49	Chicago, Ill.	Oct. 20-22, 1942	618
50	Chicago, Ill.	Oct. 20-21, 1943	597

No.	Place of Meeting	Date	Membership
51	Chicago, Ill.	Sept. 17-19, 1946	698
52	Chicago, Ill.	Sept. 16-18, 1947	651
53	Chicago, Ill.	Sept. 20-22, 1948	652
54	Chicago, Ill.	Sept. 12-14, 1949	676
55	Chicago, Ill.	Sept. 18-20, 1950	713
56	Chicago, Ill.	Sept. 17-19, 1951	676
57	Chicago, Ill.	Sept. 15-17, 1952	667
58	Chicago, Ill.	Sept. 15-17, 1953	666
59	Chicago, Ill.	Sept. 13-15, 1954	682
60	Chicago, Ill.	Sept. 19-21, 1951	625
61	Chicago, Ill.	Sept. 18-20, 1956	657
62	Chicago, Ill.	Sept. 23-25, 1957	769
63	Chicago, Ill.	Sept. 15-17, 1958	828
64	Chicago, Ill.	Sept. 15-17, 1959	863
65	Chicago, Ill.	Sept. 19-21, 1960	932
66	Chicago, Ill.	Sept. 18-20, 1961	968
67	Chicago, Ill.	Sept. 10-12, 1962	942
68	Chicago, Ill.	Oct. 14-16, 1963	887
69	Chicago, Ill.	Sept. 14-16, 1964	860
70	Chicago, Ill.	Sept. 13-15, 1965	829
71	Chicago, Ill.	Sept. 26-28, 1966	800
72	Chicago, Ill.	Oct. 11-13, 1967	799
73	Chicago, Ill.	Sept. 9-11, 1968	825
74	Chicago, Ill.	Sept. 9-11, 1969	746
75	Chicago, Ill.	Sept. 28-30, 1970	709
76	Chicago, Ill.	Sept. 13-15, 1971	719
77	Chicago, Ill.	Sept. 18-20, 1972	706
78	Chicago, Ill.	Sept. 17-19, 1973	750
79	Chicago, Ill.	Oct. 1- 3, 1974	683

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	1891-1892	1892-1893	1893-1894	1894-1895
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	A. E. Killam	H. Rettinghouse	J. S. Lemond	J. S. Lemond
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	H. Rettinghouse	W. H. Finley	W. O. Eggleston	H. H. Eggleston
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	G. W. Rear	E. B. Ashby	S. C. Tanner	Lee Jutton
	W. F. Steffens	C. E. Smith	Lee Jutton	F. F. Strouse
	E. B. Ashby	S. C. Tanner	W. F. Strouse	C. R. Knowles
	W. O. Eggleston	Lee Jutton	C. R. Knowles	A. Ridgway

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	A. Ridgway	J. S. Robinson	D. C. Zook	J. H. Johnston
	J. S. Robinson	J. P. Wood	A. B. McVay	E. T. Howson
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Asst. Sec.			F. E. Weise	F. E. Weise
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	J. H. Johnston	G. A. Manthey	E. K. Barrett	O. F. Dalstrom
	E. T. Howson	E. T. Howson	F. C. Baluss	S. D. Corey
	C. W. Wright	J. H. Johnston	Maro Johnson	W. B. Hotson
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3rd V.-Pres.	E. T. Howson	F. C. Baluss	Maro Johnson	J. S. Huntoon
4th V.-Pres.	F. C. Baluss	Maro Johnson	J. S. Huntoon	C. S. Heritage
Sec.-Treas.	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Asst. Sec.	F. E. Weise	F. E. Weise	F. E. Weise	F. E. Weise
Directors	S. T. Corey	J. S. Huntoon	C. S. Heritage	A. I. Gauthier
	W. B. Hotson	A. I. Gauthier	W. B. Hotson	E. L. Sinclair
	P. N. Nelson	E. L. Sinclair	P. N. Nelson	P. F. Dalstrom
	J. S. Huntoon	C. S. Heritage	A. I. Gauthier	W. T. Krausch
	A. I. Gauthier	W. B. Hotson	E. L. Sinclair	R. C. Bardwell
	E. L. Sinclair	P. N. Nelson	O. F. Dalstrom	H. I. Benjamin

	1927-1928	1928-1929	1929-1930	1930-1934
President	F. C. Baluss	Maro Johnson	J. S. Huntoon	C. S. Heritage
1st V.-Pres.	Maro Johnson	J. S. Huntoon	C. S. Heritage	A. I. Gauthier
2nd V.-Pres.	J. S. Huntoon	C. S. Heritage	A. I. Gauthier	H. I. Benjamin
3rd V.-Pres.	C. S. Heritage	A. I. Gauthier	H. I. Benjamin	W. T. Krausch
4th V.-Pres.	A. I. Gauthier	H. I. Benjamin	W. T. Krausch	T. H. Strate
Sec.-Treas.	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Asst. Sec.	F. E. Weise	F. E. Weise		
Directors	W. T. Krausch	R. C. Henderson	G. A. Rodman	E. C. Neville
	R. C. Bardwell	J. S. Ekey	W. A. Batey	H. H. Best
	H. I. Benjamin	T. H. Strate	F. W. Hillman	J. E. King
	R. C. Henderson	G. A. Rodman	E. C. Neville	A. B. Scowden
	T. H. Strate	W. A. Batey	H. H. Best	W. A. Batey
	J. S. Ekey	F. W. Hillman	J. E. King	L. C. Smith

	1934-1935	1935-1936	1936-1937	1937-1938
President	H. I. Benjamin	T. H. Strate	E. C. Neville	C. M. Burpee
1st V.-Pres.	T. H. Strate	E. C. Neville	C. M. Burpee	F. H. Masters
2nd V.-Pres.	E. C. Neville	C. M. Burpee	F. H. Masters	W. S. Lacher
3rd V.-Pres.	A. B. Scowden	F. H. Masters	C. A. J. Richards	C. A. J. Richards
4th V.-Pres.	W. R. Roof	C. A. J. Richards	W. S. Lacher	F. H. Cramer
Sec.-Treas.	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Directors	C. M. Burpee	A. L. McCloy	W. R. Roof	B. R. Meyers
	W. A. Batey	R. P. Luck	T. P. Soule	G. S. Crites
	L. C. Smith	H. H. Best	F. H. Cramer	R. E. Dove
	C. A. J. Richards	W. R. Roof	B. R. Meyers	T. P. Soule
	A. L. McCoy	T. P. Soule	G. S. Crites	A. Chinn
	R. P. Luck	F. H. Cramer	R. E. Dove	L. G. Byrd

	1938-1939	1939-1940	1940-1941	1941-1942
President	Armstrong Chinn	A. E. Bechtelheimer	H. M. Church	R. E. Dove
1st V.-Pres.	F. H. Cramer	F. H. Cramer	R. E. Dove	F. H. Soothill
2nd V.-Pres.	A. E. Bechtelheimer	H. M. Church	F. A. Soothill	G. S. Crites
3rd V.-Pres.	H. M. Church	R. E. Dove	G. S. Crites	A. M. Knowles
4th V.-Pres.	R. E. Dove	F. H. Soothill	A. M. Knowles	N. D. Howard
Sec.-Treas.	C. A. Lichty	C. A. Lichty		
Secretary	....	....	F. O. Whiteman	A. G. Shaver
Treasurer	....	....	F. E. Weise	F. E. Weise
Directors	L. G. Byrd	B. R. Meyers	N. D. Howard	R. E. Caudle
	W. R. Ganser	W. Walkden	L. G. Byrd	I. A. Moore
	F. H. Soothill	A. S. Krefting	K. L. Miner	W. A. Sweet
	B. R. Meyers	A. M. Knowles	R. E. Caudle	J. L. Varker
	W. Walkden	L. G. Byrd	I. A. Moore	L. E. Peyser
	A. S. Krefting	K. L. Miner	W. A. Sweet	Martin Meyer

	1942-1943	1943-1944	1944-1945	1945-1946
President	G. S. Crites	J. L. Varker	J. L. Varker	N. D. Howard
1st V.-Pres.	R. E. Caudle	R. E. Caudle	R. E. Caudle	F. G. Campbell
2nd V.-Pres.	A. M. Knowles	N. D. Howard	N. D. Howard	J. S. Hancock
3rd V.-Pres.	N. D. Howard	F. G. Campbell	F. G. Campbell	E. H. Barnhart
4th V.-Pres.	J. L. Varker	J. S. Hancock	J. S. Hancock	W. F. Martens
Secretary	A. G. Shaver† Lorene Kindred‡ Elinor V. Heffern	Elinor V. Heffern	Elise LaChance	Elise LaChance
Treasurer	F. E. Weise	C. R. Knowles	C. R. Knowles	C. R. Knowles
Treasurer Emeritus		F. E. Weise	F. E. Weise	
Directors	M. Meyer	W. F. Martens	W. F. Martens	A. B. Chapman
	L. E. Peyser	A. L. McCloy	A. L. McCloy	W. A. Huckstep
	K. L. Miner	L. C. Winkelhaus	L. C. Winkelhaus	F. R. Spofford
	F. G. Campbell	E. H. Barnhart	E. H. Barnhart	Guy E. Martin
	J. S. Hancock	A. B. Chapman	A. B. Chapman	B. R. Meyers
	L. C. Winkelhaus	L. E. Peyser	L. E. Peyser	L. E. Peyser

† To November 1, 1962 ‡ To February 1, 1943

	1946-1947	1947-1948	1948-1949	1949-1950
President	F. G. Campbell	J. S. Hancock	E. H. Barnhart	W. F. Martens
1st V.-Pres.	J. S. Hancock	E. H. Barnhart	W. F. Martens	W. A. Huckstep
2nd V.-Pres.	E. H. Barnhart	W. F. Martens	W. A. Huckstep	Guy E. Martin
3rd V.-Pres.	W. F. Martens	W. A. Huckstep	Guy E. Martin	F. R. Spofford
4th V.-Pres.	W. A. Huckstep	G. E. Martin	F. R. Spofford	Lee Mayfield
Treasurer	Elise LaChance	Elise LaChance	Elise LaChance	Elise LaChance
Treasurer	C. R. Knowles	C. R. Knowles	L. C. Winkelhaus	L. C. Winkelhaus
Directors	Guy E. Martin	H. M. Harlow	Lee Mayfield	H. M. Harlow
	B. R. Meyers	H. B. Christianson	F. M. Misch	V. E. Engman
	L. E. Peyser	F. R. Spofford	W. D. Gibson	G. W. Benson
	H. M. Harlow	Lee Mayfield	H. M. Harlow	F. M. Misch
	H. B. Christianson	Franz M. Misch	V. E. Engman	L. R. Morgan
	F. R. Spofford	W. D. Gibson	G. W. Benson	J. A. Jorlett

	1950-1951	1951-1952	1952-1953	1953-1954
President	W. A. Huckstep	Guy E. Martin	F. R. Spofford	Lee Mayfield
1st V.-Pres.	Guy E. Martin	F. R. Spofford	Lee Mayfield	H. M. Harlow
2nd V.-Pres.	F. R. Spofford	Lee Mayfield	H. M. Harlow	J. A. Jorlett
3rd V.-Pres.	Lee Mayfield	H. M. Harlow	J. A. Jorlett	R. R. Gunderson
4th V.-Pres.	H. M. Harlow	J. A. Jorlett	R. R. Gunderson	W. H. Huffman
Secretary	Elise LaChance	Elise LaChance	Elise LaChance	Elise LaChance
Treasurer	L. C. Winkelhaus	L. C. Winkelhaus	L. C. Winkelhaus	L. C. Winkelhaus
Directors	F. M. Misch	M. H. Dick	W. H. Huffman	M. H. Dick
	L. R. Morgan	R. R. Gunderson	L. R. Morgan	J. F. Warrenfells
	J. A. Jorlett	J. F. Warrenfells	B. M. Stephens	G. Switzer
	M. H. Dick	W. H. Huffman	M. H. Dick	B. M. Stephens
	R. R. Gunderson	L. R. Morgan	J. F. Warrenfells	W. H. Bunge
	J. F. Warrenfells	B. M. Stephens	G. Switzer	E. R. Schlaf

	1954-1955	1955-1956	1956-1957	1957-1958
President	H. M. Harlow	J. A. Jorlett	R. R. Gunderson	W. H. Huffman
1st V.-Pres.	J. A. Jorlett	R. R. Gunderson	W. H. Huffman	M. H. Dick
2nd V.-Pres.	R. R. Gunderson	W. H. Huffman	M. H. Dick	B. M. Stephens
3rd V.-Pres.	W. H. Huffman	M. H. Dick	B. M. Stephens	H. D. Curie
4th V.-Pres.	M. H. Dick	B. M. Stephens	H. D. Curie	
Secretary	Elise LaChance	Elise LaChance	Elise LaChance	Elise LaChance
Treasurer	L. C. Winkelhause	L. C. Winkelhaus	L. C. Winkelhaus	L. C. Winkelhaus
Directors	B. M. Stephens	J. F. Warrenfels	W. H. Bunge	G. W. Benson
	W. H. Bunge	H. D. Curie	E. R. Schlaf	J. M. Lowry
	E. R. Schlaf	J. M. Lowry	G. W. Benson	H. H. Matthews
	J. F. Warrenfells	W. H. Bunge	J. M. Lowry	T. M. von Sprecken
	H. D. Curie	E. R. Schlaf	T. M. von Sprecken	W. H. Bunge
	J. M Lowry	G. W. Benson	H. A. Matthews	E. R. Schlaf

	1958-1959	1959-1960	1960-1961	1961-1962
President	M. H. Dick	B. M. Stephens	H. D. Curie	G. W. Benson
1st V.-Pres.	B. M. Stephens	H. D. Curie	G. W. Benson	J. M. Lowry
2nd V.-Pres.	H. D. Curie	G. W. Benson	J. M. Lowry	E. R. Schlaf
3rd V.-Pres.	G. W. Benson	J. M. Lowry	E. R. Schlaf	H. A. Matthews
Secretary	Ruth Weggeberg	Ruth Weggeberg	Ruth Weggeberg	Ruth Weggeberg
Treasurer	L. C. Winkelhaus	L. C. Winkelhause	L. C. Winkelhaus	L. C. Winkelhause
Directors	J. M. Lowry	W. H. Bunge	H. A. Matthews	R. C. Baker
	R. C. Baker	E. R. Schlaf	M. J. Hubbard	R. H. Miller
	W. H. Bunge	H. A. Matthews	R. C. Baker	Shirley White
	E. R. Schlaf	M. J. Hubbard	R. H. Miller	H. M. Wilson
	H. A. Matthews	R. C. Baker	Shirley White	R. D. Hellweg
	M. J. Hubbard	R. H. Miller	H. M. Wilson	F. W. Hutcheson

	1962-1963	1963-1964	1964-1965	1965-1966
President	J. M. Lowry	E. R. Schlaf	R. C. Baker	H. M. Wilson
1st V.-Pres.	E. R. Schlaf	R. C. Baker	H. M. Wilson	R. D. Hellweg
2nd V.-Pres.	H. A. Matthews	Shirley White	R. D. Hellweg	J. W. DeValle
3rd V.-Pres.	R. C. Baker	H. M. Wilson	J. W. DeValle	W. F. Armstrong
Secretary	Ruth Weggeberg	Ruth Weggeberg	Ruth Weggeberg	Ruth Weggeberg
Treasurer	L. C. Winkelhaus	E. F. Snyder	E. F. Snyder	E. F. Snyder
Directors	Shirley White	R. D. Hellweg	W. F. Armstrong	J. A. Goforth
	H. M. Wilson	F. W. Hutcheson	J. S. Ellis	E. R. Simmons
	R. D. Hellweg	W. F. Armstrong	J. A. Goforth	N. D. Bryant
	F. W. Hutcheson	J. W. DeValle	E. R. Simmons	A. R. Dahlberg
	W. F. Armstrong	J. A. Goforth	N. D. Bryant	J. S. Ellis
	J. W. DeValle	E. R. Simmons	A. R. Dahlberg	T. L. Fuller

	1966-1967	1967-1968	1968-1969	1969-1970
President	R. D. Hellweg	J. W. DeValle	W. F. Armstrong	J. A. Goforth
1st V.-Pres.	J. W. DeValle	W. F. Armstrong	J. A. Goforth	A. R. Dahlberg
2nd V.-Pres.	W. F. Armstrong	J. A. Goforth	A. R. Dahlberg	T. L. Fuller
3rd V.-Pres.	J. A. Goforth	A. R. Dahlberg	T. L. Fulle	N. D. Bryant
Secretary	Ruth Weggeberg	Ruth Weggeberg	Ruth Weggeberg	Ruth Weggeberg
Treasurer	W. H. Huffman	W. H. Huffman	W. H. Huffman	W. H. Huffman
Directors	N. D. Bryant	J. S. Ellis	N. F. Lucas	W. H. Rankin
	A. R. Dahlberg	T. L. Fuller	W. L. Short	E. E. Runde
	H. F. Lucas	R. A. Youngblood	C. E. Wachter	T. A. Reynolds
	J. S. Ellis	H. F. Lucas	A. C. Jones	J. J. Ridgeway
	T. L. Fuller	W. L. Short	W. H. Rankin	J. R. Williams
	R. A. Youngblood	C. E. Wachter	E. E. Runde	J. W. Chambers
	V. D. Raessler	A. C. Jones	T. A. Reynolds	R. E. Frame
	W. L. Short	W. H. Rankin	J. J. Ridgeway	J. C. Hobbs
	C. E. Wachter	E. E. Runde	J. R. Williams	

	1970-1971	1971-1972	1972-1973	1973-1974
President	A. R. Dahlberg	T. L. Fuller	N. D. Bryant	E. E. Runde
1st V.-Pres.	T. L. Fuller	N. D. Bryant	E. E. Runde	J. J. Ridgeway
2nd V.-Pres.	N. D. Bryant	E. E. Runde	J. J. Ridgeway	J. R. Williams
3rd V.-Pres.	E. E. Runde	J. J. Ridgeway	J. R. Williams	W. R. Rankin
Secretary	Ann Wilson	Ann Wilson	Ann Wilson	Ann Wilson
Treasurer	W. H. Huffman	W. H. Huffman	W. H. Huffman	W. H. Huffman
Directors	T. A. Reynolds	J. W. Chambers	R. K. Corbett	D. C. Gould
	J. J. Ridgeway	R. E. Frame	J. R. Iwinski	W. S. Stokely
	J. R. Williams	J. C. Hobbs	J. S. Pritchett	W. C. Sturm
	J. W. Chambers	R. K. Corbett	D. C. Gould	J. W. Davidson
	R. E. Frame	J. R. Iwinsky	W. S. Stokeley	C. A. Hughes
	J. C. Hobbs	J. S. Pritchett	W. C. Sturm	W. R. Hyma
	R. K. Corbett	D. C. Gould	J. W. Davidson	O. C. Denz
	J. R. Iwinsky	W. S. Stokeley	C. A. Hughes	R. C. McMaster
	J. S. Pritchett	W. C. Sturm	W. R. Hyma	W. E. Brakenslek

CONSTITUTION

ARTICLE I.

NAME

Section 1. This association shall be known as the American Railway Bridge & Building Association.

ARTICLE II.

OBJECT

Section 1.** The object of this association shall be the advancement of knowledge pertaining to the design, construction and maintenance of railway bridges, buildings, water service facilities, and other structures, by investigation, reports and discussions.

Section 2. The association shall neither indorse nor recommend any particular devices, trade marks or materials, nor will it be responsible for any opinions expressed in papers, reports or discussion unless the same have received the endorsement of the association in regular session.

ARTICLE III.

MEMBERSHIP

Section 1. The membership of this association shall be divided into five classes, viz: Members, life members, associate, honorary and junior members.*

Section 2.** A member shall be a person in a position above rank of gang foreman in connection with roadway bridge, building and water service work, or in the employ of a public regulatory body, a professor of engineering in a college, an engineering editor, or a government or private timber expert. Any person desirous of becoming a member shall make application upon the form prescribed by the executive committee, setting forth his name, age, residence and practical experience. He shall furnish at least three references to whom he is personally known. Applicants may be voted into membership at any regular executive meeting or by letter ballot of the executive committee, a majority vote being necessary in either instance.

Section 3.** To be eligible for a life membership a member must have belonged to the association for at least 15†† years and in general must have retired from active railway service due to age or physical disability. He shall have all the privileges of active membership, except the holding of office, and shall not be required to pay annual dues. The transfer from membership to life membership shall be made in the same manner as the election of members, as prescribed in Section 2, of this Article.

Section 4. Associates shall be responsible persons who are not eligible as members, whose pursuits or attainments qualify them to co-operate with members in the study and development of improved practices in the construction and maintenance of bridges, buildings and water facilities. They shall have all the rights of members except of voting and holding office. They shall be elected in the manner prescribed for members, in Section 2 of this Article.

Section 5. Honorary members shall be chosen from persons who have attained acknowledged eminence in some branch of engineering or railway service. Their number shall be limited to ten. Honorary members shall be proposed by not less than six active members and shall be elected by the unanimous vote of the members present at a regular meeting. They shall have all the rights of active members except that of holding office and shall be exempt from the payment of dues.

Section 6. A junior member shall be a person who is a graduate of a recognized engineering school, or who has been employed for at least two years in the design, maintenance or construction of railway bridges, buildings or structures. Applicants shall be at least 21 years of age and they shall be elected in the manner prescribed for members, in Section 2 of this article. Juniors shall have all the rights of members except that of holding office. When the attainments of a Junior are such as to qualify him as a member, he may apply for promotion and the executive committee shall authorize such promotion when qualifications warrant the action. Unless a Junior is promoted, his membership shall cease automatically when he becomes 28 years of age.*

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* Amended October 16, 1941.

** Amended September 20, 1948

†† Amended March 10, 1958.

Section 7. Any member guilty of conduct unbecoming to a railroad officer and a member of this association, or who shall refuse to comply with the rules of this association, shall forfeit his membership on a two-thirds vote of the executive committee.

Section 8. Membership shall continue until written resignation is received by the secretary, unless member has been previously expelled, or dropped for non-payment of dues in accordance with Section 1 of Article VII.

Section 9.** Only active members shall hold office in this association, and only active and life members shall be entitled to vote in the election of officers.

ARTICLE IV.

OFFICERS

Section 1§. The officers of the Association shall be a president, three vice-presidents, a secretary, a treasurer and nine directors, who, with the most recent past president, shall constitute the Executive Committee.

Section 2. The past presidents of this association, previous to the most recent past president, who continue to be members shall be privileged to attend all meetings of the executive committee, at which meetings they shall receive due notice, and be permitted to discuss all questions and to aid said committee by their advice and counsel; but said past presidents shall not have a right to vote, unless called upon to fill a quorum.

Section 3. Vacancies in any office shall be filled for the unexpired term by the executive committee without delay.

ARTICLE V.

EXECUTIVE COMMITTEE

Section 1.** The executive committee shall manage the affairs of the association and shall have full power to control and regulate all matters not otherwise provided for in the constitution and by-laws and shall exercise general supervision over the financial interests of the association, and make all necessary purchases and contracts required to conduct the general business of the association, but shall not have the power to render the association liable for any debt beyond the amount then in the treasury plus accounts receivable and not subject to other prior liabilities. All appropriations for special purposes must be acted upon at a regular meeting of the association.

Section 2. Meetings of the executive committee may be called by a majority of the members of the committee, providing 10 days' notice is given members by mail.

Section 3. Five members of the executive committee shall constitute a quorum for the transaction of business.

ARTICLE VI.

ELECTION OF OFFICERS AND TENURE OF OFFICE

Section 1. Except as otherwise provided the officers shall be elected at the regular annual meeting of the association and the election shall not be postponed except by unanimous consent of the members present at said annual meeting. The election shall be by ballot, a majority of the votes cast being required for election. Any active member of the association not in arrears for dues shall be eligible for office, but the president shall not be eligible for re-election.

Section 2.§ The president, three vice-presidents, secretary and treasurer shall hold office for one year and the directors for three years, three directors being elected each year. All officers shall retain their office until their successors are elected and installed. A director elected for a three-year term shall not be eligible to serve two consecutive terms.

Section 3.† The term of office of the secretary and the treasurer may be terminated at any time by a two-thirds vote of the executive committee. Their compensation shall be fixed by a majority vote of the executive committee.

The secretary shall also serve as secretary of the executive committee.

Section. 4. The secretary and the treasurer shall be required to give bond in an amount to be fixed by the executive committee.

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* Amended October 16, 1941.

† Amended September 21, 1957.

§ Amended September 28, 1966.

ARTICLE VII.

MEMBERSHIP FEE AND DUES

Section 1.† Every member upon joining this association shall pay to the secretary an entrance fee and dues as prescribed by the executive committee. No member in arrears for annual dues shall be entitled to vote at any election and any member more than one year in arrears, may be stricken from the list of members at the discretion of the executive committee.

Section 2.‡ A person stricken from the list of members because of non-payment of dues, upon written application may be reinstated as a member in his former class without loss of privileges, either upon payment of all back dues (which must accompany applicants) or at the discretion of the executive committee voting in the manner prescribed in Section 2, Article III.

ARTICLE VIII.*

LOCAL SECTIONS

Section 1.** Upon the application of ten or more members of the association residing in the same geographical district, or having offices therein, the executive committee shall organize a local section for that district, to which all members in that district shall be eligible. Such local section shall admit to active membership only members in good standing. It shall hold not less than two meetings each year, and shall be governed by such constitution and by-laws not inconsistent with the constitution of this association as the section membership may adopt and the executive committee approve.

Section 2. The parent association shall not be put under any obligation, either financial or in the matter of policy or opinion, by any local section.

ARTICLE IX.

AMENDMENTS

Section 1. This constitution may be amended at any regular meeting by a two-thirds vote of the members present, provided that notice of the proposed amendment or amendments has been sent to the members at least 30 days previous to said regular meeting.

By-Laws

TIME OF MEETING

1.** The regular meeting of this association shall convene annually during the month of September, the exact date to be fixed by the executive committee.

PLACE OF MEETING

2.** The place of holding the annual convention shall be Chicago, Ill.

3. It shall be within the power of the executive committee to change the location or time of the meeting if it becomes apparent that it is for the best interests of the association.

QUORUM

4. At the regular meeting of the association, 15 or more members shall constitute a quorum.

***DUES

5. The annual dues for the fiscal year ending August 31, and payable in advance, shall be as follows:*

Members, $7.00; Associate Members, $7.00; Junior Members, $5.00.

DUTIES OF OFFICERS

6.† The president shall have general supervision over the affairs of the association. He shall preside at all meetings of the association and of the executive committee; shall appoint all committees not otherwise provided for, and shall be ex-officio member of all committees. He shall with the secretary sign all contracts or other written obligations of the association which have been approved by the executive committee. He shall render a detailed report at least three times during the year to the members of the executive committee, showing the financial condition of the association and its activities.

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† Amended October 17, 1940.

* Article adopted 1922.

** Amended September 20, 1948

‡ Amended September 21, 1957.

*** Amended September 15, 1965.

At the annual meeting the president shall present a report containing a statement of the general conditions of the association.

7. The vice-presidents in order of seniority shall preside at meetings in the absence of the president and discharge his duties in case of a vacancy in his office.

8.† It shall be the duty of the secretary to keep a correct record of the proceedings of all meetings of this association, and of all accounts, between this association and its members; to collect all moneys due the association, and deposit the same in the name of the association. He shall pay all bills when properly certified and approved by the president and the treasurer, and make such reports as may be called for by the executive committee. He shall also perform such other duties as the association may require.

9.‡ The treasurer shall have charge of the funds, check all deposits as made by the secretary, sign all checks after they have been approved by the president, and invest all funds not needed for current expenses as directed by the executive committee. He shall report at each annual meeting on the condition of the finances.

NOMINATING COMMITTEE

10.# After each annual meeting the president shall appoint a committee consisting of five members. Two Past Presidents shall be members of this committee, one of whom shall act as Chairman. No other officers of the Association shall be appointed to this committee. This committee shall prepare a list of names of nominees for officers to be voted on at the next annual convention in accordance with ARTICLE VI of the Constitution, said list to be read at the business session of said convention. Nothing in this section shall be construed to prevent any member making further nominations.

AUDITING COMMITTEE

11.‡ Prior to each annual meeting the president shall appoint a committee of three members, not officers of the association, whose duty it shall be to examine the accounts and vouchers of the secretary and the treasurer and certify as to the correctness of their accounts.

COMMITTEE ON SUBJECTS FOR DISCUSSION

12. After each annual meeting the president shall appoint a committee whose duty it shall be to prepare a list of subjects for investigation to be submitted for approval at the next convention.

COMMITTEE ON INVESTIGATION

13. After the association has adopted the list of subjects for investigation the president for the succeeding year shall appoint the committees who shall prepare the subjects for report and discussion. He may also appoint individual members to prepare reports on special subjects, or to report on any special or particular subject.

PUBLICATION COMMITTEE

14. After each annual meeting the executive committee shall appoint a publication committee consisting of three active members whose duty it shall be to cooperate with the secretary in the issuing of the publications of the association. The assignment of this committee shall be such that at least one member shall have served on the committee during the previous year.

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‡ Adopted October 17, 1940.
# Amended December 4, 1950.
† Amended September 20, 1948.
‡ Amended September 21, 1957.

ORDER OF BUSINESS

15.† Call to order by president.
Opening prayer or invocation.
President's address.
Report of secretary.
Report of treasurer.
Appointment of special committees.
Reports of standing committees and presentation of papers.
Unfinished business.
New business.
Election of officers.
Installation of officers.
Adjournment.

DECISIONS

16. The votes of a majority of the members present shall decide any questions. motion or resolution which shall be brought before the association, unless otherwise provided. Unless specifically provided herein otherwise, all discussions shall be governed by Robert's rules of order.

AMENDMENTS

17.† The By-Laws can be amended by a two-thirds vote of those present at any regularly called executive committee meeting.

---

† Amended September 20, 1948.

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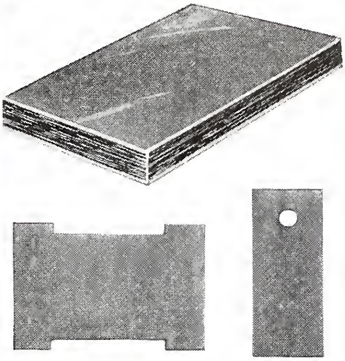

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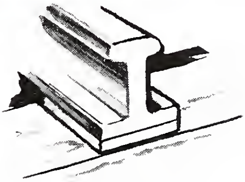

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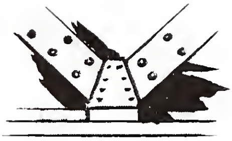

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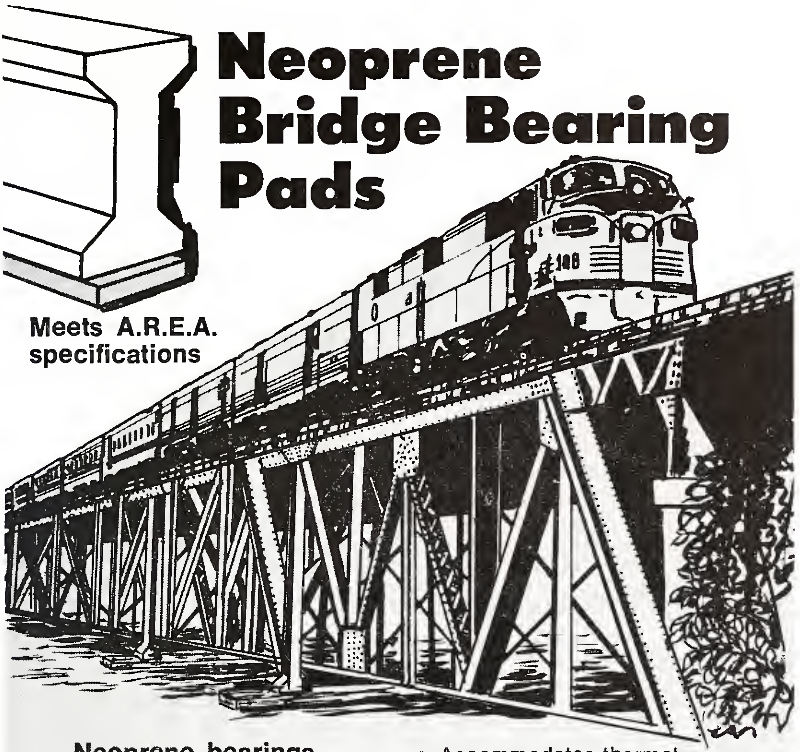

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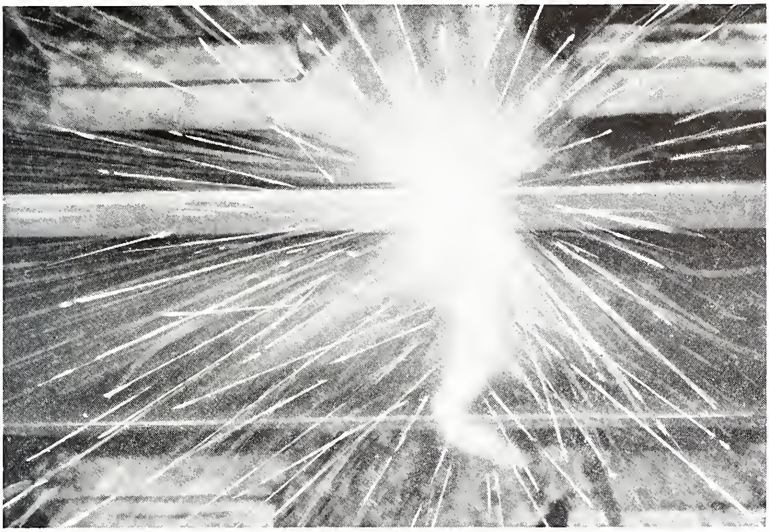

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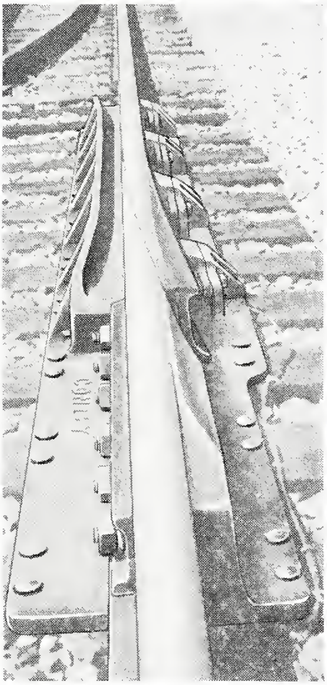

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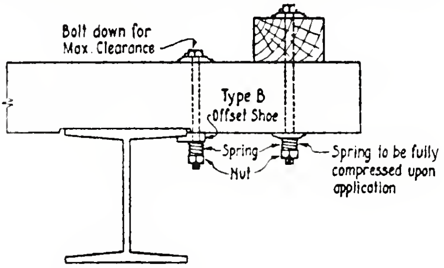
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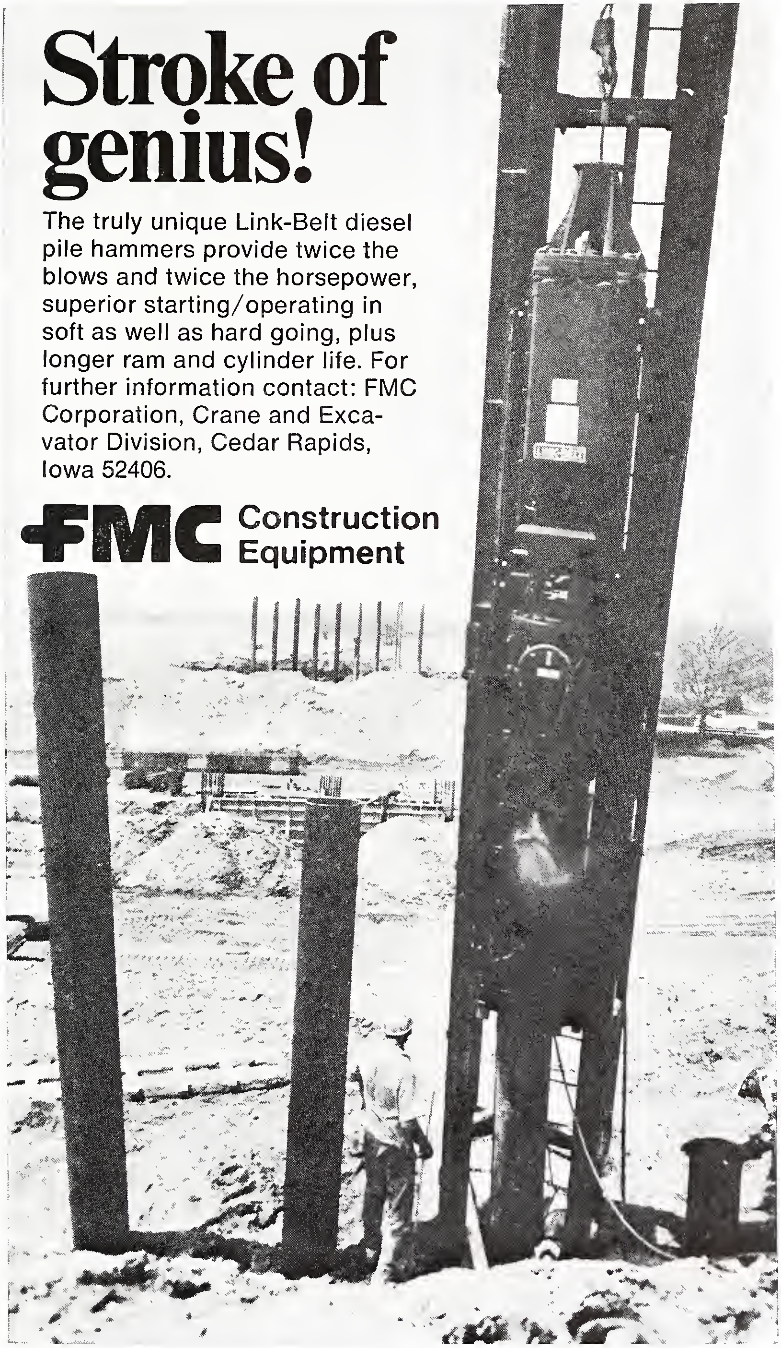

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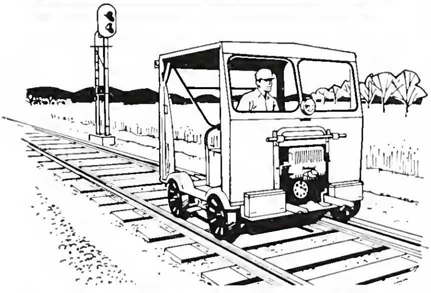

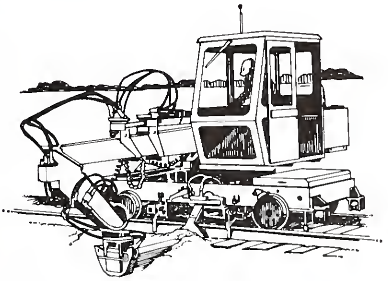

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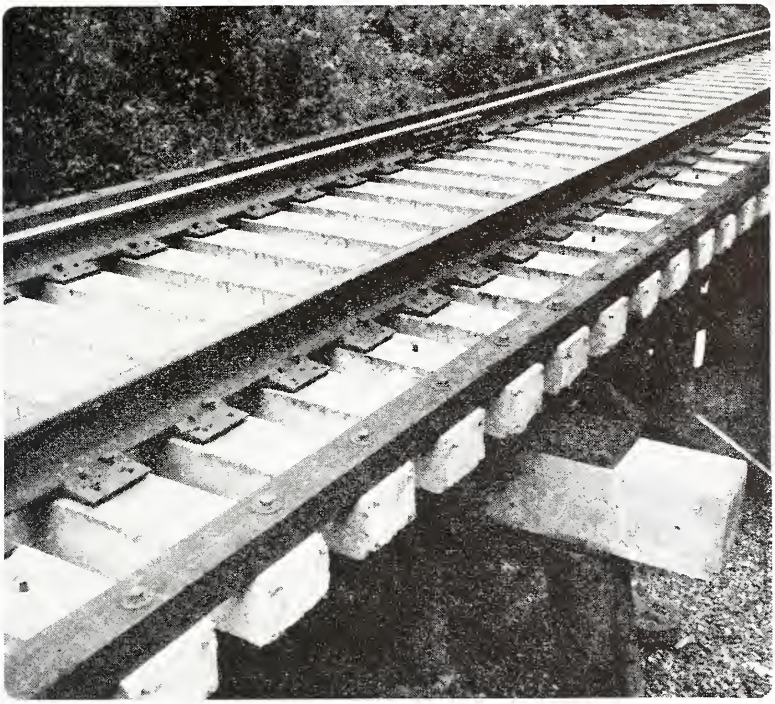

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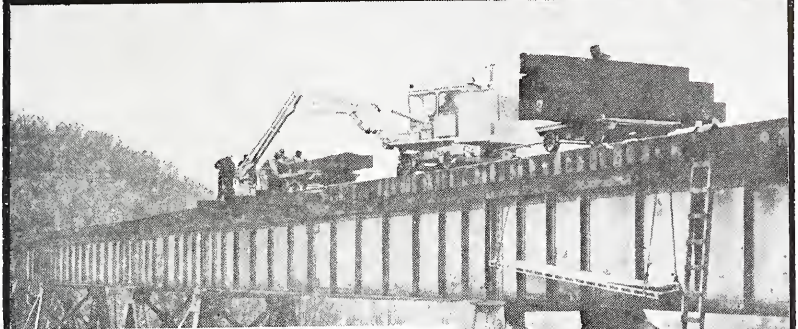

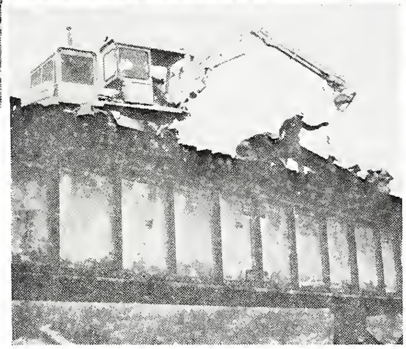

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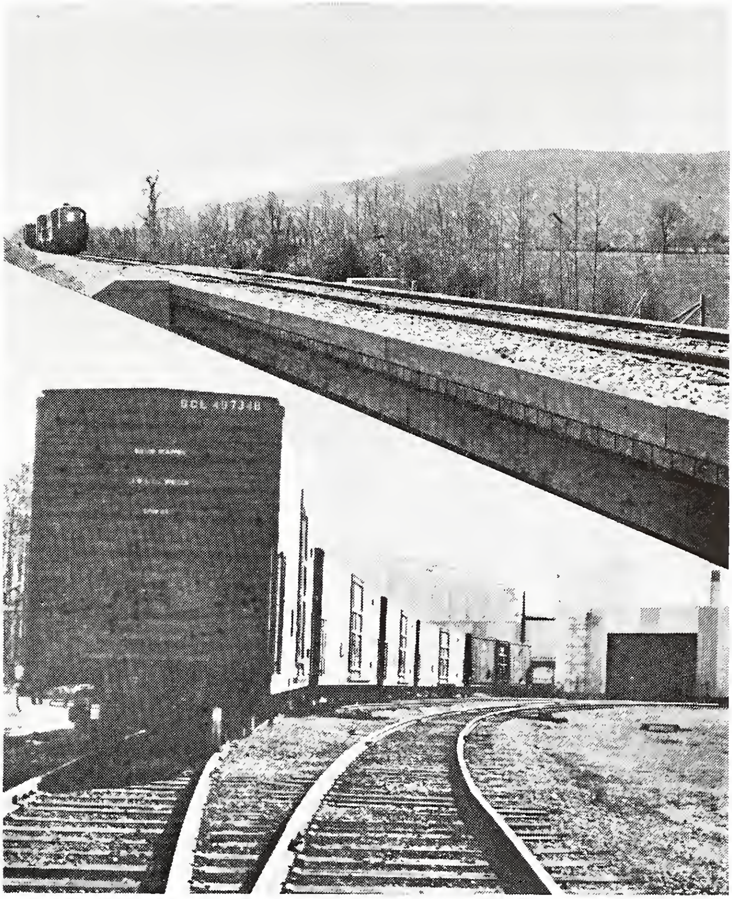

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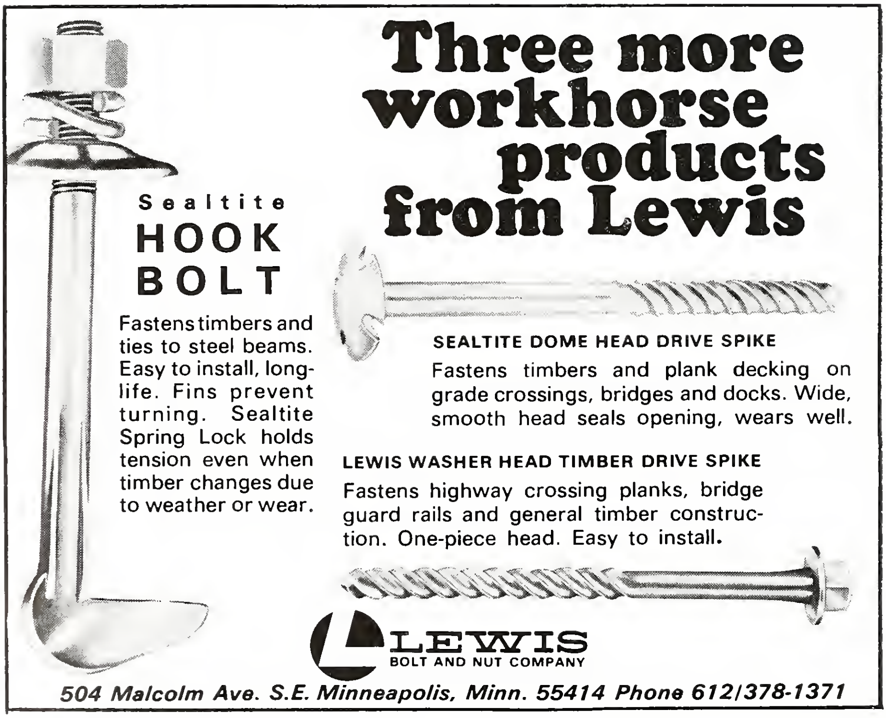
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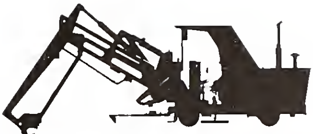

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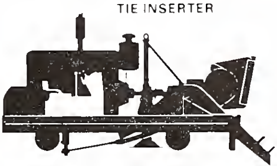

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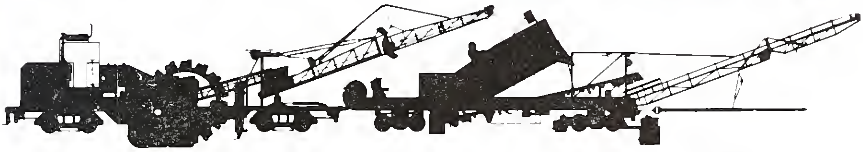

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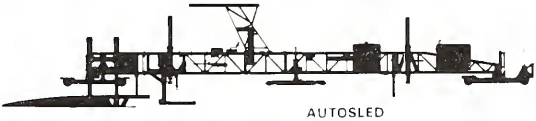

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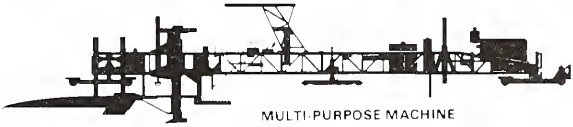

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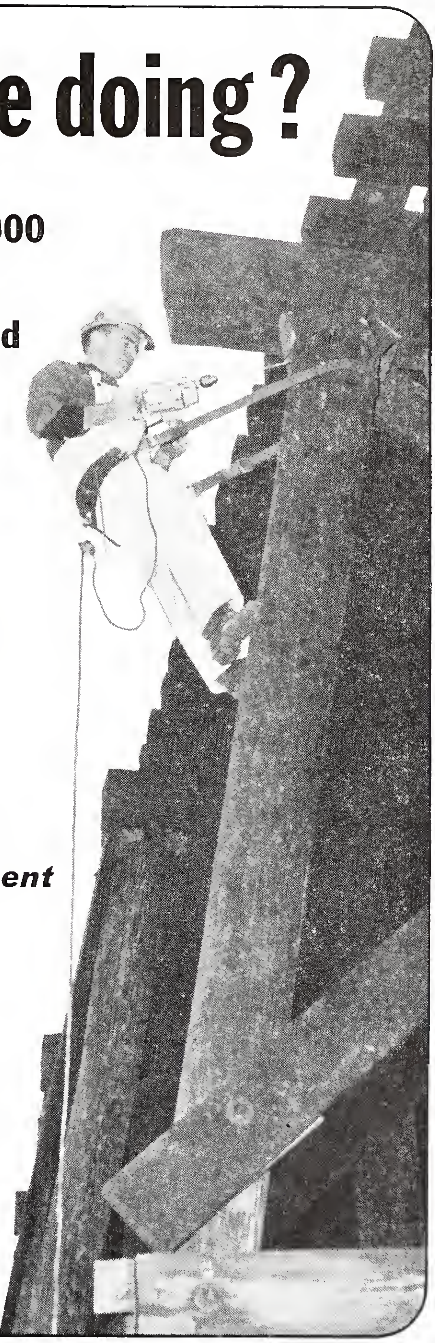

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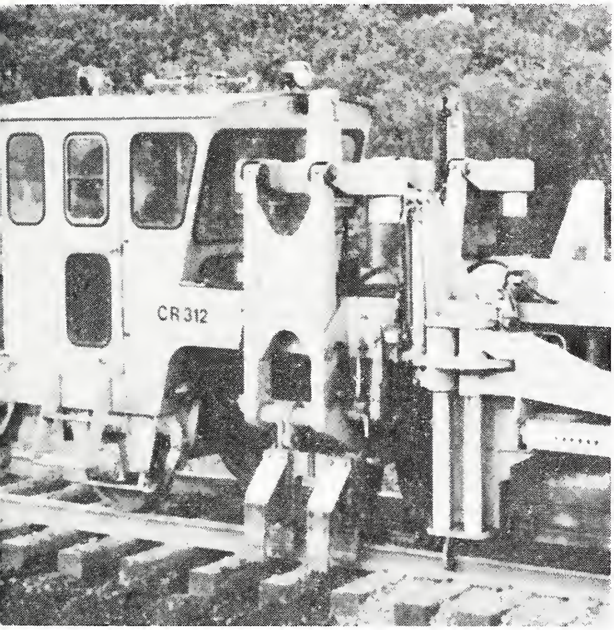

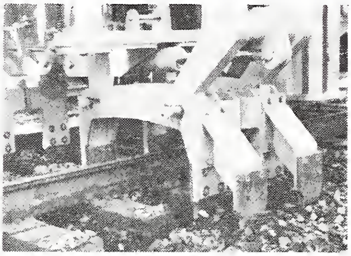

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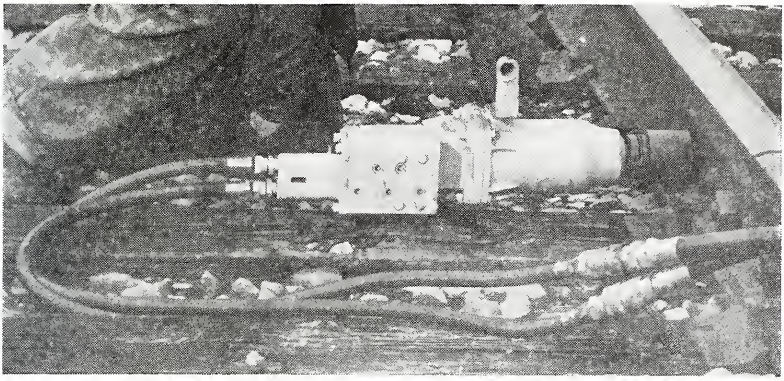

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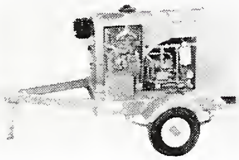

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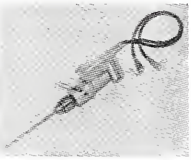

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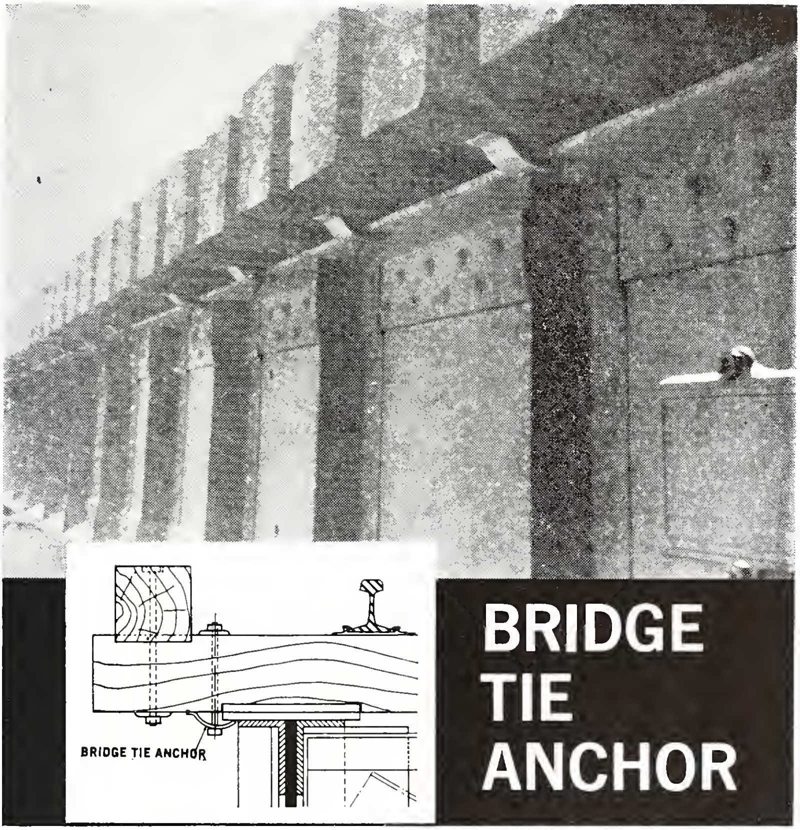

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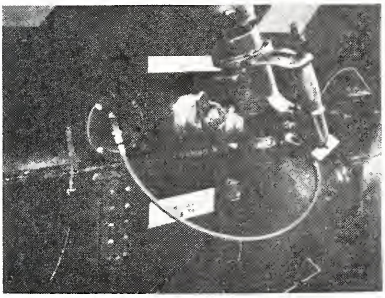
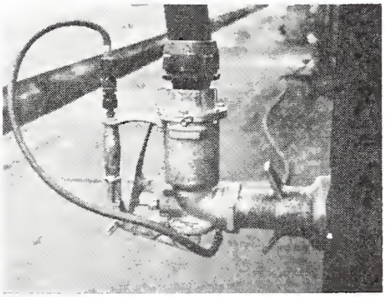


Close-Up of Snyder OPW 1620-DS Automatic Nozzle in operation, with Snyder No. 565 Quarter Turn Fuel Quick Coupling Adapter, connected to Standard Diesel Fuel Tank. Fill Adaptor.



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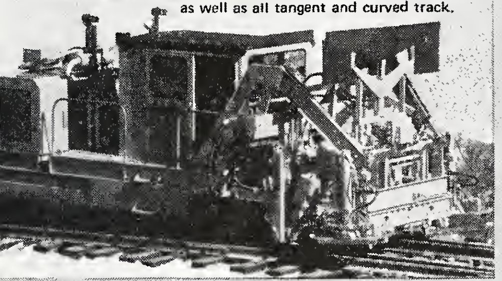

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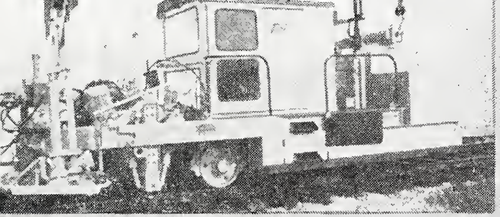

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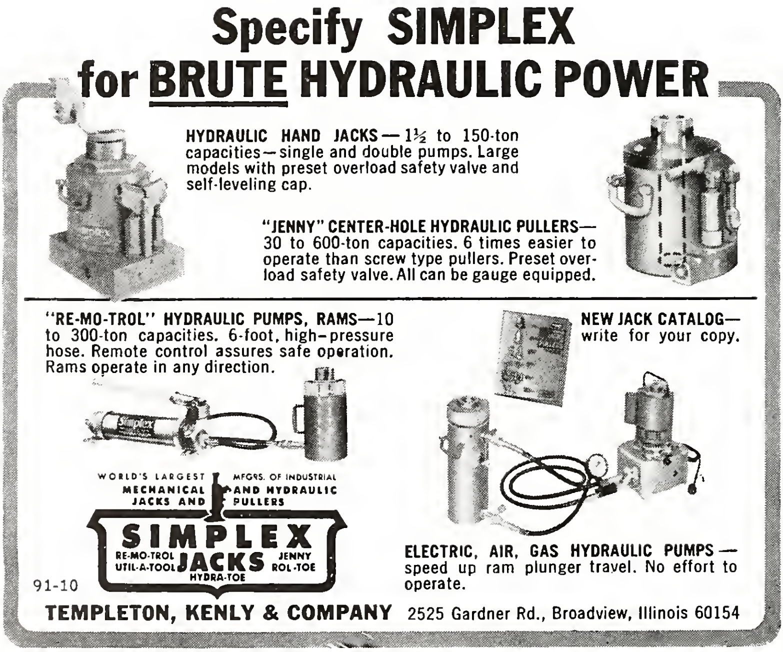

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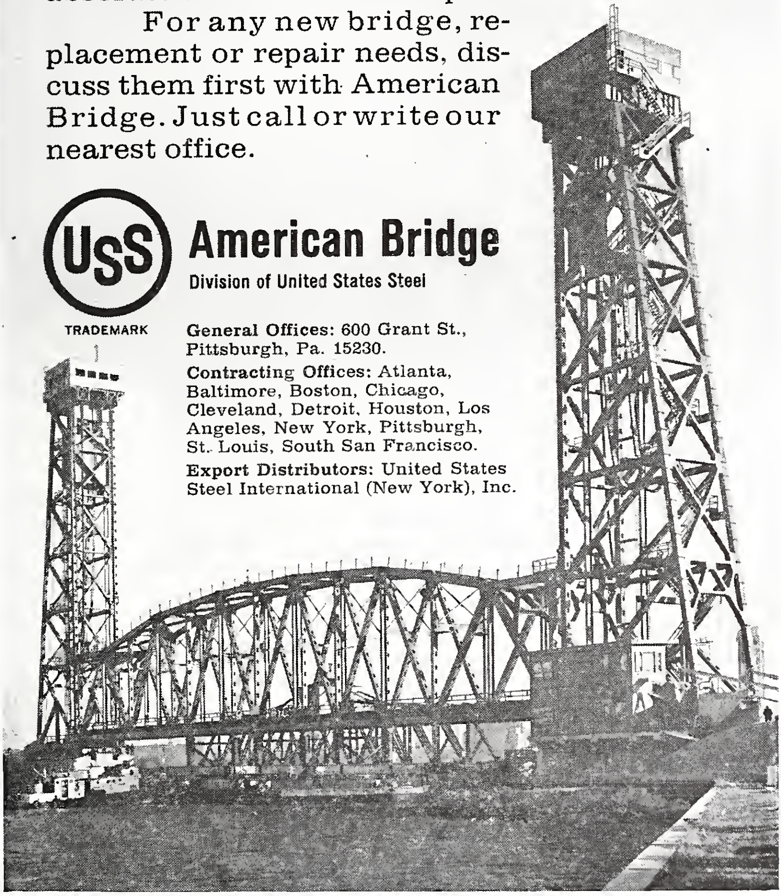

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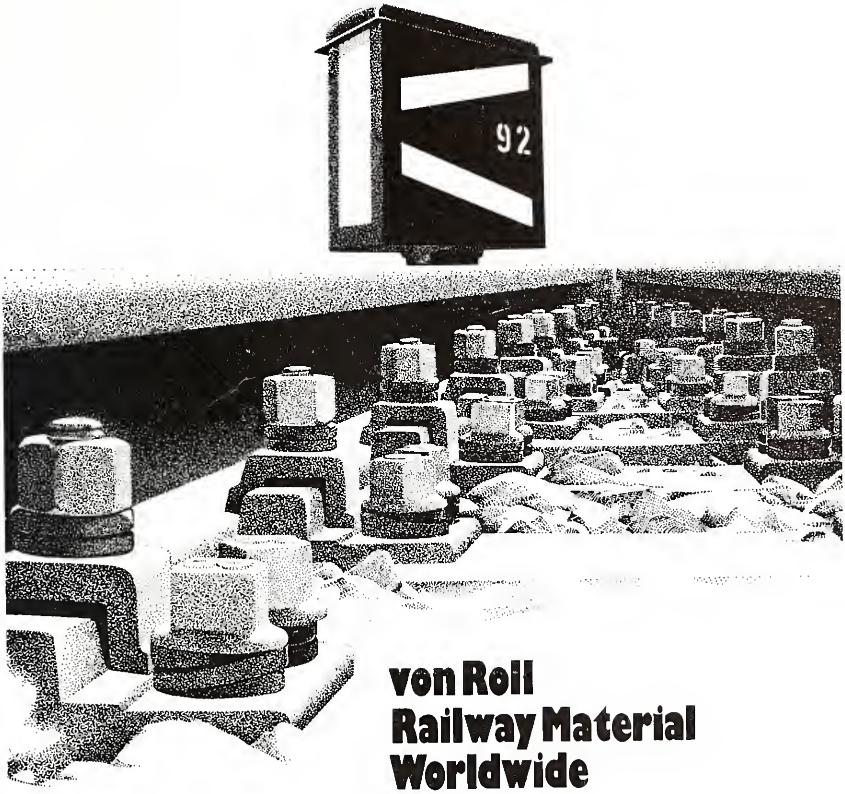

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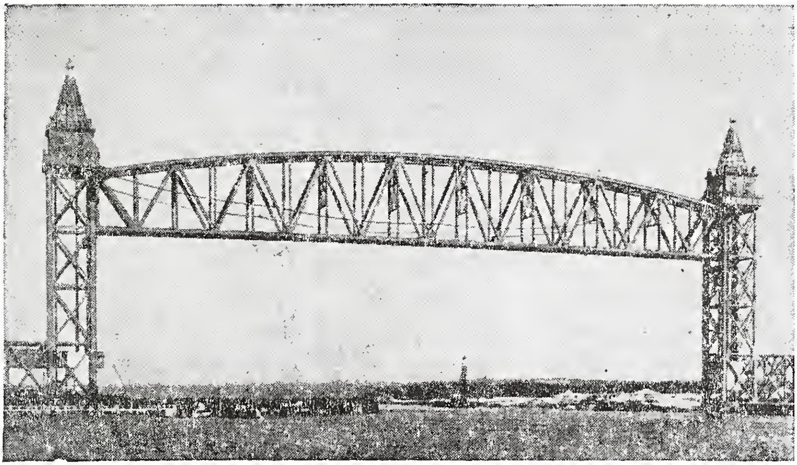

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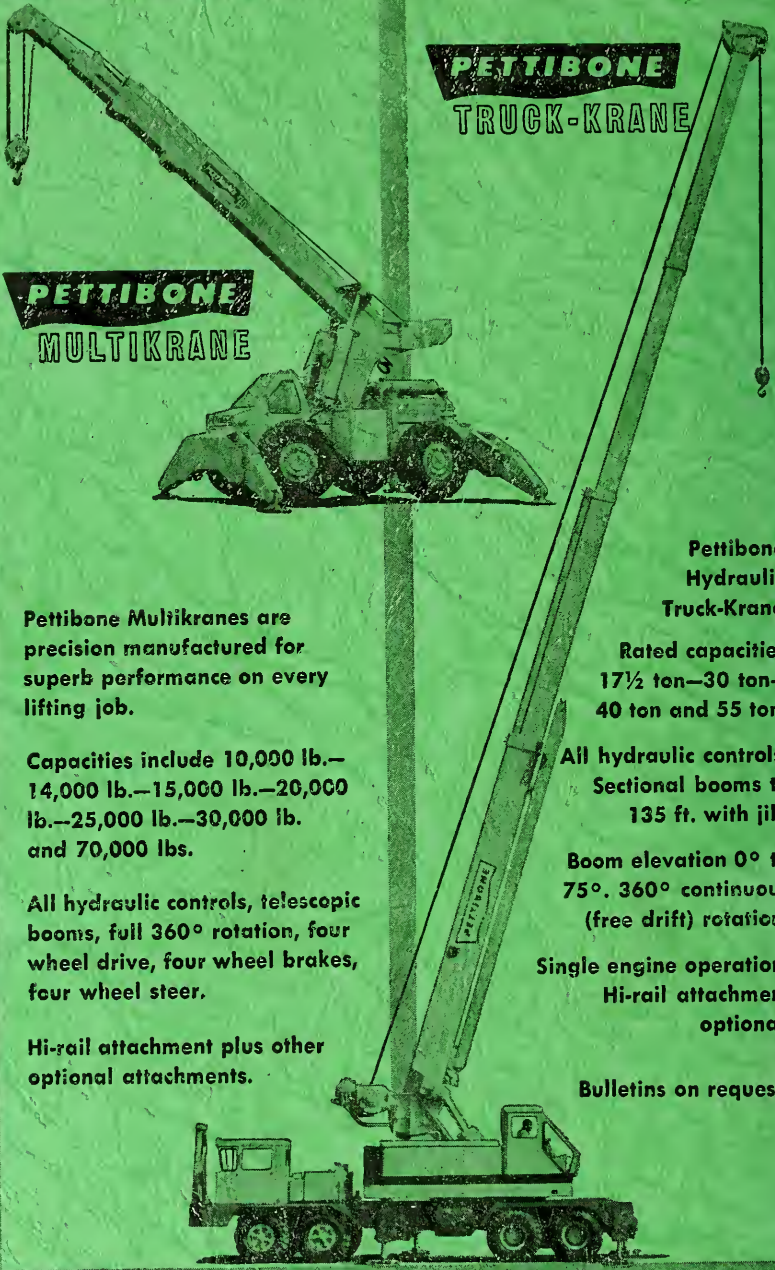

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